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FIRST BOOK

OF

ARITHMETIC

FOR

THE USE OF SCHOOLS.

DUBLIN:
PUBLISHED BY DIRECTION OF THE
COMMISSIONERS OF NATIONAL EDUCATION IN IRELAND,
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PREFACE.

In this First Book, the practical, and not the theoretical part of Arithmetic is treated of, but it is not intended that Theory should be separated from Practice. The teacher may, by means of a black board and a piece of chalk, make the pupils more readily understand the rules, than could be done by any written explanation, especially at this stage of their progress.

For the theoretical part of Arithmetic, teachers and monitors are referred to the Second Book of Arithmetic published by the Commissioners.

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ARITHMETICAL TABLES.

ADDITION TABLE.

2 and 1 are 3
2 — 2 — 4
2 — 3 — 5
2 — 4 — 6
2 — 5 — 7
2 — 6 — 8
2 — 7 — 9
2 — 8 — 10
2 — 9 — 11
2 — 10 — 12
2 — 11 — 13
2 — 12 — 14
3 and 1 are 4
3 — 2 — 5
3 — 3 — 6
3 — 4 — 7
3 — 5 — 8
3 — 6 — 9
3 — 7 — 10
3 — 8 — 11
3 — 9 — 12
3 — 10 — 13
3 — 11 — 14
3 — 12 — 15
4 and 1 are 5
4 — 2 — 6
4 — 3 — 7
4 — 4 — 8
4 — 5 — 9
4 — 6 — 10
4 — 7 — 11
4 — 8 — 12
4 — 9 — 13
4 — 10 — 14
4 — 11 — 15
4 — 12 — 16
5 and 1 are 6
5 — 2 — 7
5 — 3 — 8
5 — 4 — 9
5 and 5 are 10
5 — 6 — 11
5 — 7 — 12
5 — 8 — 13
5 — 9 — 14
5 — 10 — 15
5 — 11 — 16
5 — 12 — 17
6 and 1 are 7
6 — 2 — 8
6 — 3 — 9
6 — 4 — 10
6 — 5 — 11
6 — 6 — 12
6 — 7 — 13
6 — 8 — 14
6 — 9 — 15
6 — 10 — 16
6 — 11 — 17
6 — 12 — 18
7 and 1 are 8
7 — 2 — 9
7 — 3 — 10
7 — 4 — 11
7 — 5 — 12
7 — 6 — 13
7 — 7 — 14
7 — 8 — 15
7 — 9 — 16
7 — 10 — 17
7 — 11 — 18
7 — 12 — 19
8 and 1 are 9
8 — 2 — 10
8 — 3 — 11
8 — 4 — 12
8 — 5 — 13
8 — 6 — 14
8 — 7 — 15
8 — 8 — 16
8 and 9 are 17
8 — 10 — 18
8 — 11 — 19
8 — 12 — 20
9 and 1 are 10
9 — 2 — 11
9 — 3 — 12
9 — 4 — 13
9 — 5 — 14
9 — 6 — 15
9 — 7 — 16
9 — 8 — 17
9 — 9 — 18
9 — 10 — 19
9 — 11 — 20
9 — 12 — 21
11 and 1 are 12
11 — 2 — 13
11 — 3 — 14
11 — 4 — 15
11 — 5 — 16
11 — 6 — 17
11 — 7 — 18
11 — 8 — 19
11 — 9 — 20
11 — 10 — 21
11 — 11 — 22
11 — 12 — 23
12 and 1 are 13
12 — 2 — 14
12 — 3 — 15
12 — 4 — 16
12 — 5 — 17
12 — 6 — 18
12 — 7 — 19
12 — 8 — 20
12 — 9 — 21
12 — 10 — 22
12 — 11 — 23
12 — 12 — 24

MULTIPLICATION TABLE.

Twice	3 times	4 times	5 times	6 times	7 times
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6	1 are 7
2 — 4	2 — 6	2 — 8	2 — 10	2 — 12	2 — 14
3 — 6	3 — 9	3 — 12	3 — 15	3 — 18	3 — 21
4 — 8	4 — 12	4 — 16	4 — 20	4 — 24	4 — 28
5 — 10	5 — 15	5 — 20	5 — 25	5 — 30	5 — 35
6 — 12	6 — 18	6 — 24	6 — 30	6 — 36	6 — 42
7 — 14	7 — 21	7 — 28	7 — 35	7 — 42	7 — 49
8 — 16	8 — 24	8 — 32	8 — 40	8 — 48	8 — 56
9 — 18	9 — 27	9 — 36	9 — 45	9 — 54	9 — 63
10 — 20	10 — 30	10 — 40	10 — 50	10 — 60	10 — 70
11 — 22	11 — 33	11 — 44	11 — 55	11 — 66	11 — 77
12 — 24	12 — 36	12 — 48	12 — 60	12 — 72	12 — 84

8 times	9 times	10 times	11 times	12 times
1 are 8	1 are 9	1 are 10	1 are 11	1 are 12
2 — 16	2 — 18	2 — 20	2 — 22	2 — 24
3 — 24	3 — 27	3 — 30	3 — 33	3 — 36
4 — 32	4 — 36	4 — 40	4 — 44	4 — 48
5 — 40	5 — 45	5 — 50	5 — 55	5 — 60
6 — 48	6 — 54	6 — 60	6 — 66	6 — 72
7 — 56	7 — 63	7 — 70	7 — 77	7 — 84
8 — 64	8 — 72	8 — 80	8 — 88	8 — 96
9 — 72	9 — 81	9 — 90	9 — 99	9 — 108
10 — 80	10 — 90	10 — 100	10 — 110	10 — 120
11 — 88	11 — 99	11 — 110	11 — 121	11 — 132
12 — 96	12 — 108	12 — 120	12 — 132	12 — 144

EXTENDED MULTIPLICATION TABLE.

13 times	14 times	15 times	16 times	17 times	18 times	19 times
2 are 26	2 are 28	2 are 30	2 are 32	2 are 34	2 are 36	2 are 38
3 .. 39	3 .. 42	3 .. 45	3 .. 48	3 .. 51	3 .. 54	3 .. 57
4 .. 52	4 .. 56	4 .. 60	4 .. 64	4 .. 68	4 .. 72	4 .. 76
5 .. 65	5 .. 70	5 .. 75	5 .. 80	5 .. 85	5 .. 90	5 .. 95
6 .. 78	6 .. 84	6 .. 90	6 .. 96	6 .. 102	6 .. 108	6 .. 114
7 .. 91	7 .. 98	7 .. 105	7 .. 112	7 .. 119	7 .. 126	7 .. 133
8 .. 104	8 .. 112	8 .. 120	8 .. 128	8 .. 136	8 .. 144	8 .. 152
9 .. 117	9 .. 126	9 .. 135	9 .. 144	9 .. 153	9 .. 162	9 .. 171

PENCE TABLE.

d.		*s.*	*d.*	*d.*		*s.*	*d.*	*d.*		*s.*	*d.*	*d.*		*s.*	*d.*
12	are	1	0	35	are	2	11	57	are	4	9	79	are	6	7
13	—	1	1	36	—	3	0	58	—	4	10	80	—	6	8
14	—	1	2	37	—	3	1	59	—	4	11	81	—	6	9
15	—	1	3	38	—	3	2	60	—	5	0	82	—	6	10
16	—	1	4	39	—	3	3	61	—	5	1	83	—	6	11
17	—	1	5	40	—	3	4	62	—	5	2	84	—	7	0
18	—	1	6	41	—	3	5	63	—	5	3	85	—	7	1
19	—	1	7	42	—	3	6	64	—	5	4	86	—	7	2
20	—	1	8	43	—	3	7	65	—	5	5	87	—	7	3
21	—	1	9	44	—	3	8	66	—	5	6	88	—	7	4
22	—	1	10	45	—	3	9	67	—	5	7	89	—	7	5
23	—	1	11	46	—	3	10	68	—	5	8	90	—	7	6
24	—	2	0	47	—	3	11	69	—	5	9	91	—	7	7
25	—	2	1	48	—	4	0	70	—	5	10	92	—	7	8
26	—	2	2	49	—	4	1	71	—	5	11	93	—	7	9
27	—	2	3	50	—	4	2	72	—	6	0	94	—	7	10
28	—	2	4	51	—	4	3	73	—	6	1	95	—	7	11
29	—	2	5	52	—	4	4	74	—	6	2	96	—	8	0
30	—	2	6	53	—	4	5	75	—	6	3	97	—	8	1
31	—	2	7	54	—	4	6	76	—	6	4	98	—	8	2
32	—	2	8	55	—	4	7	77	—	6	5	99	—	8	3
33	—	2	9	56	—	4	8	78	—	6	6	100	—	8	4
34	—	2	10												

EXTENDED PENCE TABLE.

d.		£.	*s.*	*d.*	*d.*		£	*s.*	*d.*	*d.*		£	*s.*	*d.*	*d.*		£	*s.*	*d.*
140	are	0	11	8	1300	are	5	8	4	2500	are	10	8	4	3700	are	15	8	4
200	..	0	16	8	1400	..	5	16	8	2600	..	10	16	8	3800	..	15	16	8
240	..	1	0	0	1440	..	6	0	0	2640	..	11	0	0	3840	..	16	0	0
300	..	1	5	0	1500	..	6	5	0	2700	..	11	5	0	3900	..	16	5	0
400	..	1	13	4	1600	..	6	13	4	2800	..	11	13	4	4000	..	16	13	4
480	..	2	0	0	1680	..	7	0	0	2880	..	12	0	0	4080	..	17	0	0
500	..	2	1	8	1700	..	7	1	8	2900	..	12	1	8	4200	..	17	10	0
600	..	2	10	0	1800	..	7	10	0	3000	..	12	10	0	4300	..	17	18	4
700	..	2	18	4	1900	..	7	18	4	3100	..	12	18	4	4320	..	18	0	0
720	..	3	0	0	1920	..	8	0	0	3120	..	13	0	0	4400	..	18	6	8
800	..	3	6	8	2000	..	8	6	8	3200	..	13	6	8	4500	..	18	15	0
900	..	3	15	0	2100	..	8	15	0	3300	..	13	15	0	4560	..	19	0	0
960	..	4	0	0	2160	..	9	0	0	3360	..	14	0	0	4700	..	19	11	8
1000	..	4	3	4	2200	..	9	3	4	3400	..	14	3	4	4800	..	20	0	0
1100	..	4	11	8	2300	..	9	11	8	3500	..	14	11	8	4900	..	20	8	4
1200	..	5	0	0	2400	..	10	0	0	3600	..	15	0	0	5000	..	20	16	8

SIGNS USED IN ARITHMETIC.

$+$ named plus, signifies Addition, as $4+2$ equal 6.
$-$ named minus, signifies Subtraction, as $5-2$ equal 3.
$\times$ multiplied by, signifies Multiplication, as 4×2 equal 8.
$\div$ divided by, signifies Division, as $10\div 2$ equal 5.
$=$ equal to, signifies Equality, as $2+4=6$.

: is to
: : so is
: to
signifies Proportion as 1 : 2 : : 3 : 6
These figures are thus read, as 1 is to 2 so is 3 to 6.

$\sqrt{\ }$ marks the Square root, as $\sqrt{4}=2$.
$\sqrt[3]{\ }$ marks the Cube root, as $\sqrt[3]{8}=2$.

MONEY.

4 farthings = 1 penny
12 pence = 1 shilling
20 shillings = 1 pound
21 shillings = 1 guinea

£ denotes pounds, *s.* shillings, and *d.* pence.
¼ —— one farthing, or one quarter of any thing.
½ —— a halfpenny, or a half of any thing.
¾ —— three farthings, or three quarters of any thing.

AVOIRDUPOIS WEIGHT.

			marked.
16 drams (*dr.*)	=	1 ounce	*oz.*
16 ounces	=	1 pound	*lb.*
28 pounds	=	1 quarter	*qr.*
4 quarters or 112lb.	=	1 hundred weight	*cwt.*
20 hundred weight	=	1 ton	*T.*

14 pounds make one stone, and 8 stone 1 hundred weight.

This weight is used for bread, meat, grocery, for goods in general, d for all the metals except gold and silver.

TROY WEIGHT.

		marked
24 grains (*gr.*)	= 1 pennyweight,	*dwt.*
20 pennyweights	= 1 ounce	*oz.*
12 ounces	= 1 pound	*lb.*

This weight is used for gold, silver, jewels, and liquors.

APOTHECARIES' WEIGHT.

		marked
20 grains	= 1 scruple	*scr.*
3 scruples	= 1 dram	*dr.*
8 drams	= 1 ounce	*oz.*
12 ounces	= 1 pound	*lb.*

Apothecaries use this weight in mixing their medicines; but they buy and sell by avoirdupois weight.

LONG MEASURE.

		marked
12 lines	= 1 inch,	*in.*
12 inches	= 1 foot,	*ft.*
3 feet	= 1 yard,	*yd.*
5½ yards	= 1 perch,	*per.*
40 perches	= 1 furlong,	*fur.*
8 furlongs	= 1 mile,	*ml.*
3 miles	= 1 league,	*lg.*
60 Geographical miles, or 69½ British miles	= 1 degree.	*deg.*
360 degrees	= the earth's circumference.	

An Inch is supposed to be equal to three barley-corns in length. Seven yards Irish, equal one perch. Eleven miles Irish are equal to fourteen miles English. 4 inches make one hand, used in measuring horses.

CLOTH MEASURE.

		marked.
2¼ inches	= 1 nail	*nl.*
4 nails	= 1 quarter	*qr.*
4 quarters	= 1 yard	*yd.*

The Flemish ell is 3 quarters of a yard; the English ell 5 quarters of a yard; and the French ell 6 quarters of a yard.

SQUARE OR LAND MEASURE.

				marked
144	square inches	=	1 square foot	*sq. ft.*
9	square feet	=	1 square yard	*sq. yd.*
30¼	square yards	=	1 square perch	*sq. per.*
40	square perches	=	1 rood	*rd.*
4	roods	=	1 acre	*ac.*
640	acres	=	1 square mile	*sq. mile.*

In Ireland 49 square yards make 1 square pole or perch. The square of any number is obtained by multiplying it by itself, 12 multiplied by 12 = 144, the square of 12.

CUBIC, OR SOLID MEASURE.

1728	cubic inches	=	1 cubic foot
27	cubic feet	=	1 cubic yard
40	cubic feet of rough timber, or 50 cubic feet of hewn timber	=	1 ton, or load
42	cubic feet	=	1 ton of shipping

A cube is a solid figure, similar to dice, and has six equal sides. The cube of any number is obtained by multiplying it twice by itself—thus, 12 × 12 × 12 = 1728, the cube of 12.

MEASURE OF CAPACITY.

				marked
4	gills	=	1 pint	*pt.*
2	pints	=	1 quart	*qt.*
4	quarts	=	1 gallon	*gal.*
2	gallons	=	1 peck	*pk.*
4	pecks	=	1 bushel	*bush.*
8	bushels	=	1 quarter	*qr.*
5	quarters	=	1 load	*ld.*

By this measure both liquids and dry goods are measured. The gill, pint, quart, gallon are used for liquids. The peck, bushel, quarter, load are used for dry goods. The gallon contains 277,274 cubic inches.

The measure formerly called heaped measure is now, by Act of Parliament, declared illegal.

Ale, wine, and beer were formerly measured by different measures. In some places a barrel of beer contains 32, in some 34, and in others 36 gallons. A hogshead of ale was computed to contain 54 gallons, a hogshead of wine 63 gallons.

2 hogsheads make 1 pipe, or butt.
2 pipes, or butts make 1 tun.

WOOL WEIGHT.

		marked
7 pounds	= 1 clove	*cl.*
2 cloves	= 1 stone	*st.*
2 stones	= 1 tod	*td.*
6½ tods	= 1 wey	*wy.*
2 weys	= 1 sack	*sk.*
12 sacks	= 1 last	*la.*

TIME.

		marked
60 seconds (*sec.*)	= 1 minute	*min.*
60 minutes	= 1 hour	*hr.*
24 hours	= 1 day	*da.*
7 days	= 1 week	*wk.*
12 months, or 52 weeks and 1 day, or 365 days	= 1 year	*yr.*

Every fourth year contains 366 days, and is called leap year

DAYS IN EACH MONTH.

Thirty days hath September,
April, June, and November;
All the rest have thirty-one
February twenty-eight alone,
But in Leap-Year twenty-nine.

DIVISIONS OF THE CIRCLE.

		marked
60 seconds″	= 1 minute	*min.* or ′
60 minutes	= 1 degree	*deg.* or °
30 degrees	= 1 sign	*S.*
12 signs	= 1 circle of the zodiac	*C*

QUANTITIES.

		marked
12 articles	= 1 dozen	*doz.*
20 articles	= 1 score	*sc.*
144 articles	= 1 gross	*gr.*
24 sheets paper	= 1 quire	*qr.*
20 quires	= 1 ream	*rm.*

NUMERATION TABLE.

1	Units
21	Tens
,321	Hundreds
4,321	Thousands
54,321	X. of Thousands
654,321	C. of Thousands
7.654,321	Millions
87.654,321	X. of Millions
987.654,321	C. Millions
1,987.654,321	M. of Millions
21,987.654,321	C. M. of Millions
.321,987.654,321	X.M. of Millions
4.321,987.654,321	Billions

ROMAN NOTATION.

M.	D.	C.	L.	X.	V.	I.
1000	500	100	50	10	5	1

EXERCISES IN NUMERATION.

Read, or write down in words the numbers signified by the following figures:

1. 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.
2. 10, 11, 14, 16, 19, 20, 42, 18, 17.
3. 200, 420, 607, 986, 473, 247, 364.
4. 912, 874, 783, 650, 202, 604, 510.
5. 4000, 2700, 8601, 7036, 2101, 1060.
6. 1010, 7030, 4600, 9111, 4076, 5870.
7. 26012, 70101, 42100, 36100, 90201.
8. 700000, 701020, 926427, 104206.
9. 9000000, 9764268, 8202100, 5023067.
10. 2600060, 4101010, 2004000, 1402149.
11. 40000000, 29602687, 50026017, 1670020.
12. 941258767, 267602607, 401467680.
13. 296026876, 710020010, 270603050.
14. 1402360740, 3460760010, 4023601497.
15. 7042603714, 5079607906, 1704070600.
16. 81462306012, 46007687681, 94086421360.
17. 14023641201, 20860002001, 40002000202.
18. 907060206204, 240026100201, 590960126020.

EXERCISES IN NOTATION.

Express in Figures the following Numbers.

1. Six, —seven,—nine,—eight,—five,—ten,—twelve,—fourteen,—sixteen,—eighteen,—twenty,—nineteen.

2. Seventy-four, —twenty-six, — thirty-one,—forty-nine, — fifty-eight, — sixty-two, — seventy-six, — seventy-seven,— ninety-seven, — eighty-four, — fifty-five, — ninety-nine.

3. One hundred,—one hundred and four,—two hundred and forty-four,—six hundred and ninety-one,—seven hundred and fifty,—nine hundred and nine,—nine hundred and ninety-nine,—eight hundred and two.

4. Four thousand,—four thousand two hundred,—five thousand three hundred and fifty-two,—six thousand seven hundred and five,—seven thousand and fifty,—nine thousand and two,—eight thousand and eighty,—six thousand seven hundred and seven.

5. Ten thousand—fifteen thousand five hundred and sixty,—nineteen thousand and nineteen,—twenty-six thousand five hundred and ninety five,—thirty-eight thousand and thirty-eight,—forty thousand and forty,—fifty-six thousand five hundred and two,—seventy thousand seven hundred and seventy-seven.

6. Four hundred thousand,—four hundred thousand and forty,—six hundred thousand seven hundred and seven,— nine hundred and eighty thousand,—two hundred and fifty-six thousand nine hundred and seventy-five,—seven hundred thousand seven hundred and seven,—nine hundred and sixty-four thousand two hundred and fifty-nine.

7. Six millions,—five millions four hundred and ninety-three thousand,—eight millions forty thousand four hundred and two,—seven millions four hundred and ninety-three thousand seven hundred and sixty-five,—ten millions ten thousand and ten,—twenty millions two hundred and forty thousand six hundred and six,—fifty-three millions fifty-three thousand and fifty-three,—eight hundred and fifty-three millions nine hundred and forty-eight thousand six hundred and fifty-three,—two hundred and three millions four hundred and six thousand five hundred and eight,—nine hundred and ninety-three millions.

SIMPLE ADDITION.

Addition is the method of finding one number equal to two or more numbers.

Add together 423, 134, 267.

Rule with Example.—Write the numbers under each other, so that units may stand under units, tens under tens, hundreds under hundreds, &c. Draw a line under them. Add the figures in the right hand column together, thus 7 and 4 make 11, 11 and 3 make 14. Put down the figure 4 of the number 14. Take the 1 of the 14, and add it to the next column; thus, 1 and 6 make 7, 7 and 3 make 10, 10 and 2 make 12, Put down the figure 2 of the 12. Add the figure 1 of the 12 to the next column; thus, 1 and 2 make 3, 3 and 1 make 4, 4 and 4 make 8. Put down the 8. The number 824 is called the *Sum*.

423
134
267
824

EXERCISES.

1	2	2	3	1	4	3	3
2	3	0	1	5	1	2	4
3	4	6	4	2	4	6	5
6	9	8	8	8	9	11	12

2	4	6	3	4	5	3	4
1	2	4	4	3	4	7	6
3	3	2	5	6	7	8	9

12	21	23	14	21	42
11	12	24	35	34	23
23	24	35	43	75	97
46	57	82	92	130	162

41	84	26	37	42	23
24	24	42	25	56	59
36	53	59	74	85	64

(1)	(2)	(3)	(4)
412	243	623	354
346	325	146	236
427	678	579	875

(5)	(6)	(7)	(8)
264	450	547	856
368	407	653	479
752	679	865	627
865	536	276	894

(9)	(10)	(11)	(12)
246	457	47	8
78	608	602	70
604	92	68	926
40	400	720	47
7	78	79	5

(13)	(14)	(15)	(16)
5129	4268	3687	2407
7142	2426	4215	798
9687	4276	708	46
4312	8507	9362	7098
8687	2390	96	579

(17)	(18)	(19)	(20)
5126	2427	5036	786
1472	768	784	5706
6826	9412	6070	1076
9687	893	85	687
2764	4026	7507	5368
4279	475	687	759

(21)	(22)	(23)	(24)
42674	24785	48763	46537
34126	65843	86270	54263
68768	26879	4687	43986
28642	43653	578	5079
65768	68754	49060	81
74387	56287	18709	641
96728	65423	70471	98076

25. How many do 7 and 4 and 8 and 24 and 62 make?

26. How many are 42 and 64 and 40 and 68 and 79?

27. How many do 67 and 79 and 93 and 104 and 65 make

28. How many do 426 and 67 and 240 and 742 make?

29. Add together 6479 and 846 and 70 and 567 and 7426.

30. Add 742+64+8+341+804+60+642+790+806.

31. Add 7260+1404+8496+2413+46+4786+3326.

32. Add 4126+27304+2687+426+876846+746897.

33. Add 76876+2046+896874+6876874+4268+4276.

34. Add 367068+64768+94687+6870+2489+264.

35. What is the amount of four hundred and sixty-three,—five thousand and sixty-four,—seventy thousand and ninety-eight,—and fifty?

36. Add together seven hundred and ninety-six,—five thousand four hundred and forty,—nine hundred and eight,—five thousand four hundred and nine,—two hundred and two thousand, and fifty,—ninety-six thousand and nine,—four hundred and one.

37. How much do the following sums of money amount to, when added together £7966,—£864,—£46,—£2048, £46897?

38. I saw four large baskets full of apples; in one of the baskets there were four hundred and ninety-four apples, in another three hundred and sixty-eight, in another nine hundred and eighty, and in another four hundred and four; how many apples were there in the four baskets

39. I gave John 12 apples, James 15, Patrick 2, and I had still 25 remaining; how many apples had I at first?

40. In a school which I visited lately, there were six classes, in the first there were 23 boys, in the second 18, in the third 32, in the fourth 27, in the fifth 56, and in the sixth 48; can you tell me how many boys there were in the school?

41. A man walked 26 miles on Monday, 34 on Tuesday, 46 on Wednesday, 37 on Thursday, on Friday being unable to walk, he procured a horse and rode 41 miles, and completed his journey on Saturday, having travelled that day 67 miles; how many miles did he travel during the week?

42. A gentleman planted on his property 478 oaks, 748 beeches, 64027 firs, 409 apple trees, 1764 pear trees, 878 cherry trees, and 87 peach trees; how many trees did he plant in all?

43. If James has 74 marbles, John 213, Tom 185, Henry 309, William 834, and Patrick 648; how many have they in all?

44. A farmer laid out on oxen £348, on horses £487, on sheep £964, on cows £189, on labouring utensils £209; how much did he lay out altogether?

45. In a house there were nine windows in front, and each window had twelve panes of glass. In the rear there were six windows, and each of these windows had nine panes of glass; how many panes of glass were there in all the windows?

46. A fruiterer bought six chests of oranges. In the first chest there were 468 oranges; in the second 679; in the third 804; in the fourth 979; in the fifth 1042; in the sixth 1709; how many oranges were there in all the chests?

47. A linen draper sold 46 yards of cloth on Monday 78 on Tuesday; 65 on Wednesday; the same quantity on Thursday; 64 on Friday; and 97 on Saturday; how many yards of cloth did he sell during the week?

48. A grocer received for goods sold on Monday £4; on Tuesday £6; on Wednesday £10; on Thursday £9; on Friday £13; and on Saturday as much as he had received all the former days of the week; how much did he receive during the week for goods?

SIMPLE SUBTRACTION.

Subtraction is the method of finding the difference between two numbers.

From 6237 take 4895.

6237
4895
1342

Rule with Example.—Place the less number under the greater, so that units may stand under units, tens under tens, &c. Draw a line under them. Begin at the units' place, that is at the 5. Take 5 from 7 and 2 remain. Put down the 2 under the 5. Go on to the next figure which is 9. Take 9 from 3; this cannot be done; when this is the case, add 10 to the upper figure, which will make it 13. Take 9 from 13 and 4 remain. Put down the 4. Whenever 10 has been added, as it was to the 3, one is to be added to the next figure. Thus, add 1 to 8 which makes 9. Take 9 from 2, it cannot be done; then as before, add 10 to the 2. Now take 9 from 12 and 3 remain. Put down the 3. Add 1 to four, it will make 5. Take 5 from 6 and 1 remains. Put down the 1. The sum 1342 is called the *Remainder*, the *Difference* or the *Excess*. The number from which the subtraction is made, viz. 6237, is called the *Minuend*. The number which is subtracted, viz. 4895, is called the *Subtrahend*.

EXERCISES.

426 214 212	647 423 224	754 621 133	827 403 424	968 412 556
643 411	498 132	783 172	869 217	548 213
423 279 144	742 489 253	834 478 356	546 298 248	643 169 474

582 496 86	715 268 447	934 748 186	604 257 347	540 76 464
(1) 462 278	(2) 623 147	(3) 821 479	(4) 602 146	(5) 714 178
(6) 643 268	(7) 741 278	(8) 610 79	(9) 100 4	(10) 101 11

(11) 42654 26479	(12) 36871 17928	(13) 73268 47296	(14) 98643 27896
(15) 74603 37684	(16) 91020 12647	(17) 41021 768	(18) 40000 1001
(19) 42681 19697	(20) 42890 27601	(21) 81000 2641	(22) 45301 20009

(23) 741026831 278904896	(24) 614102013 178906844	(25) 148120718 74198648
(26) 861264981 248600989	(27) 921002461 198007049	(28) 181201041 89890122

29. 741826421741—427984642814
30. 841298471312— 71489641264
31. 812014001013—107987862141
32. 431701468642— 7126142687
33. 614214687648—196412741689
34. 419000100014— 2120101706

35. From seven hundred and nine thousand four hundred and twenty-seven, take two hundred and fifty-one thousand eight hundred and seventy-two.

36. From two millions two hundred and two thousand and two, take nine hundred and ninety-six thousand and seven.

37. What is the difference between sixty-five hundred thousand and four, and twenty-nine hundred thousand seven hundred and sixty?

38. How much does sixty-four thousand two hundred and four, exceed six thousand two hundred and forty-nine?

39. John lent James £9071, of this sum he has received back £999; how much has James yet to pay?

40. On a cherry tree there were 2046 cherries, of these 1875 were gathered; how many remained?

41. Columbus discovered America in the year 1492; how many years is it from that time to 1836?

42. In a certain school there are 436 boys, of these only 264 can write; how many are unable to write?

43. In one of the National Schools there are 427 boys; in another there are 249; how many more are there in the one than in the other?

44. John had 202 nuts in his pocket, but there being a hole in it, he lost 96 nuts; how many had he remaining?

45. On an apple-tree there were 165 apples, the wind blew off two dozen and a half; how many were left?

46. A draper bought 4786 yards of cloth, and sold 3987 yards; how many yards has he unsold?

47. What sum added to sixty-five thousand seven hundred and ninety-six, will make one million four hundred and fifty-two thousand three hundred and thirteen?

48. I was born in the year 1828; how old shall I be in the year 1839?

49. Ireland is about 300 miles in length, and 170 miles in breadth; how much greater is the length than the breadth?

50. Ben Nevis in Scotland, the highest mountain in the British Islands, is 4350 feet above the level of the sea; the summit of Magillicuddy's Reeks, the highest point in Ireland, is 3610; what is the difference in height between these two mountains?

51. The Shannon, the largest river in the British Isles, has a course of about 170 miles. The Amazon in South America, has a course of about 3000 miles. What is the difference in length of their course?

52. The diameter of the Sun is about 883246 miles; that of the Earth about 7912; what is the difference in the diameter of the Sun and Earth?

53. The surface of the earth is nearly 200 millions of square miles, of this it is probable that 60 millions are land; how many more square miles of water than of land are there in the earth's surface?

54. The population of London in 1831, was 1,776,556. The population of Dublin is about 203,652, how many more people are there in London than in Dublin?

55. Mont Blanc in Switzerland, is the highest mountain in Europe, being 15,680 feet above the level of the sea. Chimborazo, the highest mountain in America, is about 21,000 feet in height. What is the difference in height between these two mountains?

56. Coals were discovered at Newcastle, A. D. 1234; how long is it from that time till the year 1836?

57. Since convicts were first sent to Botany Bay, it is now, viz. 1836, about 42 years; in what year were convicts first sent?

58. Sir Isaac Newton was born A. D. 1642, and died 1727; how old was he when he died?

59. Petersburgh was founded by Peter the Great, A. D. 1703; how long is it from that time till the year 1836?

60. The art of printing was discovered about the year 1449; how long is it from that time to the year 1836?

MIXED QUESTIONS.

1. Tom had 264 marbles; he gave 64 to James, 75 to William, and 42 to John; how many had he left?

2. A merchant had 4268 yards of cloth, on Monday he sold 146 yards, on Tuesday 97, on Wednesday 246, on Thursday 198, on Friday 364, on Saturday 497; how much cloth had he remaining?

3. Three regiments went to battle, in the first there were 968 soldiers, in the second 769, and in the third 847. There were 248 men killed in the first regiment, 368 in the second, and when the regiments returned there were only 436 men in the third; how many returned from the battle?

4. A man had a journey of 298 miles to make, the first day he walked 42 miles, the second 36 miles, the third 31 miles, the fourth 27 miles; how much farther had he to go?

5. Three vessels sailed to America with emigrants, in the first vessel there were 126 men, 96 women, and 42 children; in the second vessel there were 93 men, 37 women, and 26 children; in the third vessel there were 43 men, 24 women, and 8 children. In the first vessel three persons died; in the second two were washed overboard; the third vessel was wrecked and all on board perished; how many got safe to America?

6. A little boy went to the Zoological Gardens to see the animals; he laid his hat on the ground, which contained 264 nuts; while his attention was engaged, the monkey stole 27 of his nuts; while he was pursuing the monkey, a squirrel made off with 16 more; how many had he remaining?

7. The population of Cork is about 108,000; of Belfast 55,000; of Liverpool 166,000; of Glasgow 203,000; by how much does the population of London exceed all these cities, the population of it being 1,776,556 in the year 1831?

8. Received on Monday 247*l.*; paid away on Tuesday 196*l.*; received on Wednesday 349*l.*; paid away on Thursday 402*l.*; received on Friday 687*l.*; paid away on Saturday 398*l.*; what money had I still remaining?

SIMPLE MULTIPLICATION.

Multiplication teaches us to find what a number will amount to, when it is repeated a number of times.

Case I.—*When the Multiplier does not exceed* 12.

Multiply 53 by 7.

Rule with Example.—Place the number by which you are to multiply under the number to be multiplied; then say 7 times 3 make 21. Put down the 1 under the 7. Then 7 times 5 make 35, and the 2 of the 21 make 37. Put down the 37. The 53 is called the *Multiplicand*; the 7 is called the *Multiplier*; and the 371 is called the *Product.* The multiplicand and the multiplier taken together are called the *Factors*; thus 53 and 7 are factors.

53
7
371

EXERCISES.

659	427	642	748	396
2	2	2	2	2
1318	854	1284	1496	792

486	968	687	983	758
3	3	4	4	5

896	793	378	596	974
5	6	7	8	9
4480	4758	2646	4768	8766

742	856	597	903	609
10	11	12	6	8

(1)	(2)	(3)	(4)
4276	67287	86453	75268
4	2	5	3

(5)	(6)	(7)	(8)
9468	84076	43256	74879
7	8	9	10
(9)	(10)	(11)	(12)
45687	96854	63875	47389
11	12	9	12

13. Multiply 87546 by 4
14. — 7
15. — 9
16. — 6
17. — 3
18. — 5
19. —10
20. —11
21. —12

22. Multiply 98327 by 2
23. — 7
24. — 4
25. — 8
26. — 6
27. — 5
28. — 9
29. —12
30. —11

Case II.—*When the Multiplier is a Composite number.*[*]

Multiply 436 by 32.

Rule with Example.—The multiplier, viz. 32, is formed by the two factors 4 and 8; therefore instead of multiplying by 32, you may multiply by 4, and obtain the product 1744. Multiply this product by the other factor, 8, and you obtain 13952, the product of the 436 multiplied by 32.

$$\begin{array}{r} 436 \\ 4 \\ \hline 1744 \\ 8 \\ \hline 13952 \end{array}$$

31. 426478 × 16
32. 743687 × 18
33. 968748 × 24
34. 674867 × 27
35. 643067 × 36
36. 426456 × 49

37. 368745 × 54
38. 246876 × 56
39. 784978 × 72
40. 204074 × 108
41. 436876 × 132
42. 496876 × 144

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[*] A composite number is the product of two factors; thus, 16 is a composite number, because formed of the factors 2 and 8, or 4 and 4; 21 is formed of 3 and 7; 27 of 3 and 9; 36 of 4 and 9, or 6 and 6, or 3 and 12.

Case III.—*When the Multiplier contains several figures.*

Multiply 3426 by 342.

```
   3426
    342
   6852
  13704
 10278
1171692
```

Rule with Example.—Place the multiplier under the multiplicand, units under units, &c. Multiply by the unit figure of the multiplier, viz. 2. Then multiply by the next figure of the multiplier, viz. 4; thus, 4 times 6 make 24, but take notice that you are to place the 4 of the 24 directly under that figure of the multiplier by which you are multiplying. Proceed in the same manner with the figure 3 of the multiplier. Then add together the products obtained.

Multiply 6487 by 230.

```
   6487
    230
 ------
 194610
12974
-------
1492010
```

Multiply 6487 by 203.

```
   6487
    203
 ------
  19461
1297400
-------
1316861
```

43. Mult. 98476 by 642
44. — 758
45. — 295
46. — 496
47. — 857
48. — 4368
49. — 7896
50. — 3654
51. Mult. 65839 by 958
52. — 627
53. — 369
54. — 426
55. — 704
56. — 8743
57. — 6007
58. — 9864

59. Multiply sixty-four thousand eight hundred and fifty-two, by nine hundred and eighty-seven.

60. Multiply four hundred and fifty-eight thousand six hundred and ninety-four, by eight thousand and seventy-six.

61. Multiply nine hundred and eighty-six thousand seven hundred and forty, by four hundred and nine.

62. There are 8766 hours in the year; how many hours are there in 20 years?

63. A grocer sells goods to the amount of £56 per week? how much does he sell during the year?

64. In a flock of 648 sheep; how many feet were there?

65. Suppose the page of a book to contain 49 lines, and each line 47 letters; how many letters does the whole page contain?

66. In 264 dozen of wine? how many bottles are there?

67. A gentleman dying gave orders in his will that his fortune should be equally divided among his five children; each received £648; how much money did he leave?

68. Suppose that there were in the parish 896 houses, and that each house in the parish contained five persons; what would be the population of that parish?

69. A father has five children, their food and clothing costs him two pence each a day; how many pence each does the support of the children come to in the year?

70. There were in a garden eight trees, and upon each tree there were 268 apples? how many apples were there upon all the trees;

71. There were 4768 geese plucked, and 17 quills got from each goose; how many quills were got from all?

72. There were 27 desks to be made for the school, and each desk required 29 nails; how many nails were required for all the desks?

73. In a school, there were six windows in the boys' room, and four in the girls' room; in each window there were eight panes of glass; how many panes of glass were there in all?

74. I knew two boys, one of them was lazy and lay in bed till nine, the other was an active little fellow who rose every morning at six, how many hours did the active boy gain in a year that the other lost?

75. How often does a clock strike in a year at the rate of 156 times a day?

76. How many pins may a boy point in 6 days who works 8 hours a day, and points 16,000 pins in an hour?

77. A gentleman bought an estate containing 5,968 acres, at the rate of 26*l.* per acre; how much did he pay for the estate?

78. How many miles will a person travel in 34 years, supposing he travels 9 miles per day, and there are 365 days in the year?

SIMPLE DIVISION.

Division is the method of finding how often one number is contained in another.

Case I.—*When the Divisor does not exceed* 12.

Divide 252 by 6.

Rule with Example.—Put the numbers down according to the annexed example. Find how often the figure by which you are to divide, viz. 6 is contained in the first, or first and second figures; thus, 6 in 2, there are none, then 6 in 25; there are 4 sixes in 25 and 1 over. Put down the 4 under the 5. Suppose the 1 placed before the 2, which would make it 12. Say 6 in 12. There are 2 sixes in 12. Put the 2 under the 2. The number 6 is called the *Divisor*; 252 the *Dividend*; and 42 the *Quotient*.

6)252
42

EXERCISES.

2)4628	2)6824	3)6039	4)8408
2314	3412	2013	2102
2)47658	3)76389	4)85736	6)76590
23829	25463	21434	12765
(1)	(2)	(3)	(4)
4)27645	5)68764	6)79687	7)80620
(5)	(6)	(7)	(8)
8)76426	9)28676	10)61200[illegible]	11)46267

(9)	(10)	(11)
12)76426872	8)42687642	7)96402687

(12) 9)64268762

(13) 12)46876876

(14) 8)46876400

(15) 6)76002041

(16) 9)4302601

(17) 7)41260602

18. Divide 56472689 by 2
19. —— — 3
20. —— — 4
21. —— — 5
22. —— — 6
23. —— — 7
24. —— — 8
25. —— — 9
26. —— — 10
27. —— — 11
28. —— — 12

29. Divide 74968023 by 2
30. —— — 3
31. —— — 4
32. —— — 5
33. —— — 6
34. —— — 7
35. —— — 8
36. —— — 9
37. —— — 10
38. —— — 11
39. —— — 12

Case II.—*When the Divisor is a Composite number.*

Divide 6789 by 28.

Rule with Example.—The two factors that produce 28, are 4 and 7; divide them by 4 and by 7 as in the example. The quotient found is 242, but with two remainders, viz., 3 and 1. To obtain the complete remainder, multiply the first divisor, viz. 4, by the last remainder, viz. 3, and to the product add the first remainder, viz. 1;—thus, $4\times3+1=13$ the true remainder.

$$28\left\{\begin{array}{l}4\underline{)6789}\\7\underline{)1697}\text{ remains }1\\\quad242\text{ remains }3\end{array}\right.$$

40. 426478 ÷ 16
41. 743687 ÷ 18
42. 968748 ÷ 24
43. 674867 ÷ 27
44. 643067 ÷ 36
45. 426456 ÷ 49

46. 368745 ÷ 54
47. 246876 ÷ 56
48. 784978 ÷ 72
49. 204076 ÷ 108
50. 436876 ÷ 132
51. 496876 ÷ 144

Case III.—*When the Divisor contains several figures.*

Divide 431769 by 528.

528)4317,69(817 quotient
4224
——
936
528
——
4089
3696
——
393 remainder.

Rule with Example.[*]—Put down the sum in this form. Consider whether the divisor, viz. 528, is contained in the first three figures of the dividend, viz. 431; you see at once that it is not; mark off then four figures, viz. 4317. You are now to find how often 528 is contained in 4317; for this purpose find how often the first figure of the divisor, viz. 5, is contained in the first two figures of the dividend, viz. 43. It is contained 8 times; put the 8 on the opposite side of the dividend from the divisor. Multiply 528 by 8, and put the product under the 4317; subtract, and there remains 93; bring to this the next figure of the dividend, viz. 6. You are now to find how often the divisor, 528, is contained in your new dividend, 936; find, as you did before, how often the first figure of the divisor, 5, is contained in the first figure of the dividend, 9. It is contained once; put the one beside the 8; multiply 528 by 1, and place the product under the 936; subtract and you obtain 408; bring to this the next figure of the dividend, 9. Find, as before, how often 528 is contained in 4089. Because 5 is contained 8 times in 40, you will be inclined to try 8. Do it and you will find that you obtain the product 4224, but this is greater than the 4089 from which you have to subtract it; when this is the case you must try a smaller figure, in this case take 7.

52. Divide 74236 by 42
53 —— 43
54. —— 44
55. —— 45
56. Divide 74236 by 46
57. —— 689
58. —— 799
59. —— 410

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[*] This is rather a difficult Rule to understand, and I think your Teacher could explain it to you, by means of a black board and a bit of chalk much better than I can hope to do by any written explanation; yet, if you pay attention, I shall do my best to make you understand it.

60. Divide 87403 by 611
61. —— 312
62. —— 584
63. —— 708
64. —— 246
65. —— 357
66. —— 428
67. —— 502
68. —— 618
69. —— 736
70. —— 418
71. —— 164
72. —— 857
73. —— 521
74. —— 403
75. —— 684

76. 842786 ÷ 78
77. 976842 ÷ 946
78. 4201076 ÷ 438
79. 6416879 ÷ 648
80. 2864976 ÷ 396
81. 2876407 ÷ 4107
82. 6412930 ÷ 7481
83. 9800147 ÷ 3076
84. 4078948 ÷ 4278
85. 7198641 ÷ 2864
86. 3641201 ÷ 1407
87. 2480708 ÷ 2600
88. 7864126 ÷ 7410
89. 3002602 ÷ 8000
90. 4020264 ÷ 9600
91. 9687600 ÷ 4300

92. Divide six millions seven hundred and ninety-four thousand, by four hundred and eighty thousand six hundred and nine.

93. Divide £79648 among 274 persons.

94. What is the ninth of £6037?

95. A ship sailed in four weeks 1262 miles; how much is that per day?

96. If a vessel contains 648 gallons of water; how long will it take to discharge it all, at the rate of 18 gallons an hour?

97. The population of Ireland is about eight millions, and there are about 30,000 square miles of surface; how many persons to each mile?

98. The earth is about 95 millions of miles distant from the sun; how many days would a horse take in reaching the sun, supposing he went at the rate of 45 miles per day?

99. The rays of light come from the sun to the earth in 8¼ minutes, or 495 seconds; at what rate does light move per second, the distance from the sun to the earth being 95173000 miles?

100. The circumference of the earth is about 25000 miles; how long would a man take to walk round it at the rate of 27 miles per day?

COMPOUND ADDITION.

Add together the following sums of money; £64 12*s.* 4¼*d.*, £86 15*s.* 6½*d.*, £14 16*s.* 5¾*d.*, £34 17*s.* 9¾*d.*

£	s.	d.
64	12	4¼
86	15	6½
14	16	5¾
34	17	9¾
201	2	2¼

Rule with Example.—Place pounds under pounds, shillings under shillings, &c. and draw a line under the row of figures; first add the farthings together; thus, 3 farthings and 3 farthings make 6 farthings, 6 and 2 make 8, and 1 makes 9; but are equal to 2¼. Put the ¼ under the farthings, and add the 2 pence to the pence column. Then 2 pence and 9 pence make 11, and 5 make 16, and 6 make 22, and 4 make 26; but 26 pence are equal to 2 shillings and 2 pence. Put the 2 pence under the pence column and add the 2 shillings to the shilling column; then 2 shillings and 7 shillings make 9, and 6 make 15, and 5 make 20, and 2 make 22; now come down the column adding the tens, 22 and 10 (of the 12) make 32, and 10 (of the 15) make 42, and 10 make 52, and 10 make 62. 62 shillings are equal to 3 pounds 2 shillings; set the two shillings under the shilling column, and carry the three pounds to the pound column. Proceed as in Simple Addition. The principles on which the operation depend are the same as for Simple Addition; only that the columns here do not differ from each other in a tenfold degree.

EXERCISES.

£	s.	d.
42	14	6¼
26	12	4½
34	16	7
25	13	8¾
129	17	2½

£	s.	d.
64	12	7
36	18	4½
27	14	2¼
42	11	10½
171	17	0¼

£	s.	d.
12	16	4¾
16	4	6¼
64	17	2¾
43	12	7½
137	10	9¼

(1)

43	16	7¾
65	13	4
84	12	2½
92	11	3
41	16	6¾

(2)

65	12	4
72	17	6¾
13	8	7½
16	14	8¼
72	12	4½

(3)

36	13	4½
12	8	6¼
11	19	10½
17	14	8¾
28	12	6¼

(4)			(5)			(6)		
462	16	2	684	14	0½	732	12	7¼
785	17	6¼	273	0	4	416	17	2
696	18	8½	856	12	6¾	178	0	4½
846	14	7¼	276	13	7½	423	4	0¾
765	12	4	842	15	4¼	146	16	10¼
346	7	9¾	687	17	7¾	876	19	6½

(7)			(8)			(9)		
623	16	4¼	264	16	6	560	16	9¼
846	14	6	146	17	8½	216	14	4
764	12	7½	869	19	7¼	378	12	8¾
276	11	4	796	18	0	924	17	1
876	10	5¾	210	6	4	623	9	4
798	4	10	407	2	2¾	146	16	7½
473	16	11¼	864	17	6½	876	11	10¾

(10)			(11)			(12)		
568	17	6¼	726	16	4½	143	14	4
786	14	4	894	17	6½	402	16	7½
249	16	1	107	14	5½	156	17	0¾
304	13	6¾	645	12	10¾	876	18	6½
160	14	2½	346	16	7	130	14	1
746	0	3½	568	7	1¾	679	11	4¼
876	7	1	725	16	0½	846	10	3½
416	19	10¾	268	10	6¼	765	16	5¾

(13)

	s.	*d.*
A pair of gloves ...	2	6
——— stockings	3	4
——— shoes ...	9	6

(14)

	s.	
A coat	14	
Waistcoat	5	4½
Hat	10	

(15.)

	£	s.	d.
For paving yard	4	7	0
—new-laying floor	2	5	6
1000 bricks	1	16	0
For mortar	0	14	6
—hair	0	2	6

(16)

	£	s.	d.
40 copy books	1	4	0
100 slates	0	10	6
100 slate pencils	0	0	8
8 qrs. of paper	0	9	4
500 quills	0	7	7

17. A merchant, the first year he was in business, sold goods to the amount of 476*l.* 18*s.* 7*d.*; the second year 678*l.* 14*s.* 6½*d.*; the third year 878*l.* 7*s.* 0¾*d.*; the fourth year, 917*l.* 18*s.* 7*d.*; the fifth year 1312*l.* 19*s.* 8¾*d.*; what was the amount of goods sold during the five years?

18. Bought a quantity of goods for which I paid 496*l.* 16*s.* 6*d.*; besides this I paid for packing 6*s.* 8*d.*; for case 16*s.* 6*d.*; for cord 1*s.* 6*d.*; for porterage 4*s.*; for freight 4*l.* 11*s.* 6*d.*; carriage by waggon 13*s.*; for booking 9*d.*; how much did I pay for the goods altogether?

19. A merchant purchased goods to the amount of 1468*l.* 16*s.* 7*d.*; he paid freight 27*l.* 7*s.* 6*d.*; other charges 23*l.* 14*s.* 7½*d.*; and he gained by the sale of the goods 348*l.* 19*s.* 6½*d.*; how much did he sell the goods for?

20. The expenses of building a house were as follows: architect 198*l.*; bricklayer 4762*l.*; mason 2141*l.* 16*s.* 6*d.*; carpenter 2768*l.* 17*s.* 9*d.*; plumber 896*l.* 14*s.*; glazier 478*l.* 16*s.* 6*d.*; painter 421*l.* 18*s.* 11½*d.*; and paper-hanger 243*l.* 18*s.* 7*d.*; what was the amount?

21. A merchant owes the following sums: at Liverpool 642*l.* 16*s.*; at Amsterdam 1426*l.* 18*s.* 6*d.*; at Madrid 2406*l.* 19*s.*; at Constantinople 897*l.*; at Copenhagen 786*l.* 16*s.* 8*d.*; at Lisbon 2704*l.* 17*s.* 8½*d.*; at Dresden 786*l.* 14*s.*; what was the gross amount of his debts?

22. A person went to market and laid out on the purchase of tea 2*l.* 16*s.* 7*d.*; on coffee 2*l.* 7*s.* 8¾*d.*; on sugar 3*l.* 14*s.*; on beef 2*l.* 16*s.* 6*d.*; on mutton 37*s.*; on veal 9*s.* 7½*d.*; on various other articles 3*l.* 15*s.* 7¾*d.*; how much was laid out in all?

COMPOUND SUBTRACTION.

From £64 12*s.* 6½*d.* take £27 18*s.* 8¾*d.*

£	s.	d.
64	12	6½
27	18	8¾
36	13	9¾

Rule with Example.—Place the smaller number under the greater as in Simple Subtraction. Then, 3 farthings from 2 farthings, cannot; add 4 farthings (= 1 penny) to the 2, and 3 farthings from 6, there remain 3, place the ¾ under the farthings. Add 1 to the 8; then 9 pence from 6 pence, cannot, add 12 pence (= 1 shilling) to the 6, then 9 from 18, there remain 9, put the 9 pence under the pence. Add 1 to the 18, then 19 shillings from 12 cannot; add 20 shillings (= 1 pound) to the 12, then 19 from 32, there remain 13, place the 13 under the shillings. Carry 1 to the 7 and proceed as in Simple Subtraction.

EXERCISES.

£	s.	d.	£	s.	d.	£	s.	d.
49	17	4½	64	8	3¼	73	10	5½
17	14	2¼	27	16	7½	48	18	9¾
32	3	2¼	36	11	7¾	24	11	7¾

(1)			(2)			(3)		
78	14	6¼	47	16	8½	86	17	4
29	17	8½	28	17	6¼	27	19	0¾

(4)			(5)			(6)		
68	13	7	94	0	0	83	17	9½
28	16	10¼	24	17	9½	47	0	0¾

(7)			(8)			(9)		
88	18	8¼	17	6	7	20	11	11½
7	19	8¾	0	19	11¼	1	17	11½

(10)			(11)			(12)		
56	12	0½	24	19	8½	48	12	8
17	12	0¾	7	12	9	17	19	8½

13. From 4298*l.* 16*s.* 6½*d.*, take 1490*l.* 19*s.* 8¾*d.*

14. Take 2704*l.* 19*s.* 8½*d.*, from 17024*l.* 18*s.* 0*d.*

15. How much will remain of 4968*l.* if you take away 1467*l.* 19*s.* 6¼*d.*?

16. I lent John 2046*l.* 15*s.* 0*d.*; he has paid me 1276*l.* 14*s.* 9*d.*; how much does he still owe me?

17. A person was sent to the Bank to receive 467*l.*; in returning he lost two fifty pound notes, and three ten pound notes; how much had he remaining?

18. There were two houses worth 246*l.* 18*s.* 0*d*; one of them was sold for 121*l.* 16*s.* 6*d.*; what was the value of the other house?

19. A cow and calf were worth 16*l.* 7*s.* 10½*d.*; but the calf alone was worth 2*l.* 6*s.* 7¾*d.*; can you tell me the value of the cow?

20. A farmer owed 164*l.* 10*s.* 0*d.*; he gave to his creditors a horse worth 24*l.*; a cow worth 16*l.* 14*s.* 6*d.*, and a plough worth 13*l.* 16*s.*; how much was still due?

21. Bought a quantity of goods for 1426*l.* 16*s.*; sold them for 1537*l.* 18*s.* 6½*d.*; what was the profit?

22. A vessel, with its cargo, was worth fifty-six thousand four hundred and thirty-nine pounds; the cargo was worth thirty-four thousand nine hundred and nine pounds eight shillings and six-pence; what was the value of the ship?

23. A tradesman borrowed 1243*l.*, in January he paid 236*l.* 15*s.*; in April 197*l.* 12*s.* 6*d.*; in August 349*l.* 18*s.* 8*d.* and in December 283*l.*; how much does he yet owe?

24. A young man had in the Savings Bank 124*l.* 10*s.* 6*d.* Being sick and unable to work he drew out 8*l.* 4*s.* 8*d.* After this he went into business and laid out in the purchase of stock 42*l.* 16*s.* 6*d.*; and for fixtures 14*l.* 18*s.* what sum had he still in the bank?

25. A merchant has in cash 568*l.* 17*s.* 6*d.*; goods valued at 4794*l.* 18*s.*; a house worth 809*l.*; a ship worth 894*l.*; debts due to him 749*l.* 16*s.* 9¾*d.* He owes for goods 2475*l.* 16*s.*; an architect 374*l.* 19*s.*; and various other sums that come to 798*l.* 17*s.* 9½*d.*; what is his net stock?

COMPOUND MULTIPLICATION.

Case I.—*When the Multiplier does not exceed* 12.

Multiply £6 12*s.* 4½*d.* by 7.

Rule with Example.—Begin Multiplying the farthings by 7. Thus, 7 times ½ are 3½, set down ½ and carry 3 to the pence; 7 times 4*d.* are 2*s.* 4*d.*, and 3 carried are 2*s.* 7*d.*; set down 7 under the pence and carry 2; 7 times 12 are 84 and 2 carried are 86*s.* which is equal to 4*l.* 6*s.*; set down the 6 under the shillings, and carry 4; 7 times 6 are 42 and 4 carried make 46*l.* Place it under the pounds.

£	*s.*	*d.*
6	12	4½
		7
46	6	7½

EXERCISES.

£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d*
64	7	4¼	43	12	6½	57	16	8¾
		2			3			4
128	14	8½	130	17	7½	231	6	11

	(1)			(2)			(3)	
79	18	4¼	68	14	9¼	43	14	7½
		5			6			7

	(4)			(5)			(6)	
7	17	11½	14	0	6¾	87	12	4½
		8			9			10

	(7)			(8)			(9)	
78	16	7¾	59	19	7½	67	16	10¼
		11			12			9

	(10)			(11)			(12)	
68	10	11½	49	18	0¼	39	19	6¾
		8			7			6

Case II.—*When the Multiplier exceeds* 12.

Multiply £4 6*s*. 3*d*. by 23.

Rule with Example.—When the multiplier, viz. 23, is under a hundred, multiply the multiplicand, 4*l*. 6*s*. 3*d*., by *one* ten, and the product, 43*l*. 2*s*. 6*d*. by the number of tens, 2; then multiply the top line, viz. 4*l*. 6*s*. 3*d*. by the number of units, 3; add this to the amount obtained by multiplying by the number of tens, 2; and the sum required is obtained, viz. 99*l*. 3*s*. 9*d*.

£	*s*.	*d*.
4	6	3×3
		10
43	2	6
		2
86	5	0
12	18	9
£99	3	9

Multiply 4*l*. 6*s*. 3*d*. by 423. When the multiplier, 423, is a hundred or above it, multiply the multiplicand, 4*l*. 6*s*. 3*d*. twice by 10, and the product, 431*l*. 5*s*. by the number of hundreds, 4; then multiply the product of the first 10, 43*l*. 2*s*. 6*d*. by the number of tens, 2; and place it under the product of the 4, under 1725*l*. 0*s*. 0*d*. multiply now the first line, 4*l*. 6*s*. 3*d*. by the number of units, viz. 3; put the product obtained under the product of the tens, and add the products of the hundreds, the tens, and the units together for the answer.—For thousands multiply by four tens, and proceed in the same manner.

£	*s*.	*d*.
4	6	3×3
		10
43	2	6×2
		10
431	5	0
		4
1725	0	0
86	5	0
12	18	9
1824	3	9

Multiply £6 12*s*. 4¼*d*. by 345.

£	*s*.	*d*.		
6	12	4¼×5		
		10		
66	3	6½×4		
		10		
661	15	5		
		3		
1985	6	3	=	300
264	14	2	=	40
33	1	9¼	=	5
2283	2	2¼		345

Multiply £7 8*s*. 5*d*. by 648.

£	*s*.	*d*.		
7	8	5×8		
		10		
74	4	2×4		
		10		
742	1	8		
		6		
4452	10	0	=	600
296	16	8	=	40
59	7	4	=	8
4808	14	0		648

		£	s.	d.				£	s.	d	
13.	Mult.	64	16	7½	by 68	23.	Mult.	98	13	8¼	by 87
14	—	86	13	4½	75	24.	—	42	16	7½	45
15.	—	69	12	6½	93	25.	—	63	12	8¾	64
16.	—	648	19	7¾	68	26.	—	746	0	7¼	96
17.	—	367	16	4¼	246	27.	—	820	7	6½	268
18.	—	658	13	7	478	28.	—	763	16	0¾	403
19.	—	467	15	8¾	647	29.	—	278	9	11½	784
20.	—	675	0	4¼	608	30.	—	560	17	0¼	430
21.	—	563	12	0¾	785	31.	—	804	0	7	658
22.	—	807	14	6¼	680	32.	—	786	12	0¾	867

33. What do 4 lbs. of butter come to at 1*s.* 1*d.* per lb. ?

34 What do 6lbs. of tea come to at 5*s.* 3*d.* per lb ?

35. What do 7 gallons of spirits come to at 6*s.* 9*d.* per gallon ?

36. Patrick gets 1*s.* 9*d.* per day ; how much is that in 6 days ?

37. A grocer bought 12 cwt. of sugar, for which he paid 3*l.* 9*s.* 7½*d.* per cwt. ; how much did he pay in all ?

38. I bought eight dozen pair of gloves at 2*s.* 3*d.* per pair ; what did the whole cost me ?

39. A farmer bought 12 cows ; they cost him 9*l.* 12*s.* 6*d.* each ; how much did they all come to ?

40. Bought 11 barrels of herrings at 1*l.* 8*s.* 7½*d.* each ; what did the whole cost ?

41. Sold eight oxen, and gained upon each 2*l.* 11*s.* 7½*d.* how much did I gain ?

42. Bought 11 loads of hay at 3*l.* 17*s.* 7½*d.* each load ; how much did they come to ?

43. A gentleman spends, per day, 1*l.* 7*s.* 6*d.* ; how much does he spend in a year ?

44. A farmer paid in rent 246*l.* 16*s* 6*d.* every year ; how much did he pay the landlord in the course of 25 years ?

45. A carpenter received 14*s.* 6*d.* per week ; what did his wages amount to in the year ?

46. What is the value of 568 ounces of gold, at 3*l.* 10*s.* 6*d.* per ounce ?

47. A person spent 12*s.* 6*d.* per day, and found tha the end of the year he had saved 25 guineas; what was his annual income?

48. A farmer bought 568 sheep; he paid for them 1*l.* 12*s.* 6*d.* each; how much did the whole flock cost him?

Case III.*—*To Multiply by parts.*

Multiply 4*s.* 8½*d.* by 4½.

If the part be ¼ take a quarter of the multiplicand.

If the part be ½ take a half of the multiplicand.

If the part be ¾ take half and a quarter of the multiplicand, or divide the multiplicand by the under figure of the fraction, and multiply the product by the upper figure. Add the quotient thus obtained to the product obtained by multiplying the multiplicand by the whole number in the multiplier. This latter way applies to any fractional part.

	s.	*d.*	
	4	8½	
		4½	
	18	10	
	2	4¼	half of top line.
1	1	2¼	

Multiply £4 4*s.* 8*d.* by 4¾.

£	*s.*	*d*	
4	4	8	
		4¾	
16	18	8	
2	2	4	=½ of top line. } = ¾
1	1	2	=¼ of top line. }
20	2	2	

or

£	*s.*	*d.*	
4	4	8	
		4¾	
16	18	8	
3	3	6	=¾ of top line.
20	2	2	

49.	Mult. 4	2	6	by	4½
50.	— 7	16	7½		7¾
51.	— 28	19	8¾		9¼
52.	— 87	13	9½		12½
53.	— 874	12	10¾		10¾
54.	— 478	14	6½		11½
55.	Mult. 7	8	9½	by	7¼
56.	— 4	19	8½		9½
57.	— 48	17	6½		47½
58.	— 59	14	7¼		87⅛
59.	— 796	13	4½		$49\frac{2}{7}$
60.	— 864	16	0¼		94⅜

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* Let the pupil omit Case III., till he understands Case I. of Compound Division.

COMPOUND DIVISION.

Case I.—*When the Divisor does not exceed* 12.

Divide £8 12*s*. 7½*d*. by 6.

£	*s*.	*d*.
6)8	12	7½
1	8	9¼

Rule with Example.—Proceed thus, 6 in 8 once and 2 over, set down the 1 under the 8, and carry 40*s*. for the 2*l*. to the 12; then 6 in 52, 8 times and 4 over, set down the 8 and carry 48*d*. for the 4*s*. to the 7; then 6 in 55, 9 times and 1 over, set down the 9 and carry 4 farthings to the farthing, 4 and 2 are 6, 6 in 6 once; set down ¼

EXERCISES.

2) 74 16 8½
£37 8 4¼

3) 76 12 2¾
£25 10 8¾-2

	£	*s*.	*d*.	
1. Divide	68	17	9½	by 2
2.	42	12	3¼	3
3.	69	18	7¾	4
4.	748	15	0½	5
5.	176	19	10¾	6
6.	407	14	2½	7
7.	8647	17	11¾	8
8.	7508	13	6½	9
9.	5060	0	7¼	10
10.	8687	18	11¾	11
11.	4711	11	7½	12
12. Divide	98	14	7¼	by 7
13.	47	13	6½	8
14.	67	19	1¼	9
15.	864	1	7¾	12
16.	587	14	10½	6
17.	311	7	11¼	5
18.	4000	18	0½	10
19.	8681	11	3½	12
20.	7010	18	0¼	9
21.	3671	2	11½	8
22.	8762	17	0¾	12

23. A tradesman had in the savings bank 96*l*. 16*s*. 6*d*.; this sum he had saved in 5 years; how much did he save on an average each year?

24. Ten men rented a house at 46*l*. 14*s*. 8*d*.; how much had each to pay?

25. A father left 426*l*. 16*s*. 6*d*. to be divided equally among his eight children; how much did each get?

26. Twelve persons subscribed 28*l*. 15*s*. 6*d*. per annum, for the support of a school; how much did each subscribe?

27. A piece of cloth containing nine yards was bought for 4*l*. 16*s*. 8*d*.; how much was that per yard?

28. Bought nine dozen bottles of wine, for which I paid 16*l.* 17*s.* 9*d.*; what did I pay per dozen?

29. Nine vessels imported goods, valued at 79687*l.* 16*s.*; what was the average value of each cargo?

Case II.—*When the Divisor exceeds* 12.

Divide £64 7*s.* 8½*d.* by 47.

Rule with Example.—Divide the pounds as in simple long division. Multiply the remainder, 17, by 20, adding to it the shillings, 7. Divide again as in simple division. Multiply the remainder, 18, by 12, adding to it the pence, 8. Divide again as in simple division; multiply the remainder, 36, by 4, adding to it the farthings and Divide as before. The quotient then is 1*l.* 7*s.* 4¾*d.* with 5 of a remainder.

```
    £   s.  d.
47)64   7   8½(1
   47
   17
   20
47)347(7
   329
    18
    12
47)224(4
   188
    36
     4
47)146(3
   141
     5 remain.
```

		£.	s.	d.				£	s.	d.	
31.	Divide	47	16	4½	by 28	39.	Divide	69	16	7¾	by 4
32.		78	15	6¼	37	40.		97	13	6½	76
33.		487	19	7¾	146	41		647	14	7¾	196
34.		798	17	0½	365	42.		870	0	6½	264
35.		980	7	6¼	478	43.		993	19	7¾	489
36.		6427	14	9¾	942	44.		7086	8	0½	785
37.		7063	0	11½	806	45.		9403	17	6¾	908
38.		4317	16	8¾	718	46.		7608	16	4½	759

Case III.—*When the Divisor contains a fraction.*

Divide £24 4*s.* 6½*d.* by 2½.

Rule with Example.—Multiply both the dividend and the divisor by the under figure of the fraction, 2, adding in the upper figure 1, to the product of the divisor; and divide by short or long division as the case may require.

	£	*s.*	*d.*
2½)	24	4	6½
2			2
5)	48	9	1
	9	13	9¾ ⅕

		£	*s.*	*d.*		
47.	Divide	42	14	6½	by	3½
48.		64	17	7¼		6¼
49		97	18	8¾		7¾
50.		847	12	5½		47½
51.		948	17	6¾		76¾
52.		408	0	10½		43⅖

		£	*s.*	*d.*		
53.	Divide	64	17	6½	by	4¾
54.		87	14	2¾		9½
55.		38	12	5¼		8⅜
56.		789	0	6¾		78⅛
57.		807	16	10¼		84⅝
58.		978	17	6¾		96³⁄₇

59. A farmer rents a farm at 596*l.* 16*s.* 6*d.* per annum; he wishes to lay past as much every week as may pay the rent; how much must he save each week?

60. A merchant gained 14687*l.* in 15 years; what was his average gain per year?

61. In a large town there were 4768 children educated by 56 teachers; how many pupils on an average to each teacher?

62. A manufacturer paid in wages each week 264*l.* 17*s.* 6*d.*; there were 321 workmen; how much did each man receive?

63. There are about eight hundred millions of people in the world, and it is thought that as many die in 32 years; how many die on an average in a year?

64. If so many die in a year, how many die in an hour; there being 8765 hours in a year?

65 A prize of 7257*l.* 3*s.* 6*d.* is to be divided equally among 500 sailors; what is each man's share?

66. A gentleman had an estate of 3468 acres, for which he received per annum 879*l.* 16*s.* 8*d.*; how much was it let for per acre?

67. A tax gatherer collected 747*l.* 15*s.* 6*d.* per month, the first six months of the year; and 547*l.* 17*s.* 8*d.* per month the last six months of the year; how much did he collect daily on an average for the whole year?

68. In a savings' bank in a village there was deposited 268*l.* 17*s.* 8*d.*; and there were 56 depositors, or people who had placed money in the bank; how much had each deposited on an average?

Case IV.—*When the Divisor contains several denominations.*

Divide £32 16*s.* 8*d.* by £7 8*s.* 4*d.*

Rule with Example.—Bring both divisor and dividend to the same denomination, and proceed as in simple division. The answer will be of the denomination that the divisor and dividend have been reduced to.

```
 £   s. d.     £   s. d.
 7   8  4  )  32  16  8
20            20
----          ----
148           656
 12            12
----          ----
1780   )      7880 (4d.
              7120
              ----
               760
                 4
              ----
             )3040(¼
              1780
              ----
              1260 rem.
```

		£	s.	d.		£	s.	d.
69.	Divide	764	16	9	by	364	14	7
70.	——	987	13	8¼	—	249	17	8¾
71.	——	847	10	0¼	—	24	19	7¾
72.	——	210	3	4½	—	120	16	0¾
73.	——	901	12	10¾	—	710	10	4¼
74.	——	7826	13	3¼	—	637	14	7
75.	——	9368	14	3¾	—	42	7	0¼
76.	——	2010	16	0½	—	760	13	8½
77.	——	8103	12	1¾	—	213	12	1¼
78.	——	4100	0	0¼	—	891	14	3¼
79.	——	8968	13	7½	—	491	12	0¼

REDUCTION.

Reduction is the bringing of one denomination to another without altering its value.

Case I.—*To bring from a higher to a lower.*

Rule with Example.—Multiply by as many of the less as make one of the greater. Thus to bring 2*l.* to shillings, multiply 2 by 20, because there are 20*s.* in a pound.

£2
20
40*s.*

Case II.—*To bring a lower to a higher.*

Rule with Example.—Divide by as many of the less as make one of the greater. Thus to bring 40 shillings to pounds, divide by 20, because there are 20 shillings in a pound.

s.
2,0)4,0
£2

Bring £4 9*s.* 6½*d.* to farthings.

Multiply the 4 by 20, and add the 9*s.* to the product, this will give the number of shillings, 89*s.* Multiply then by 12 adding 6 pence this will give the number of pence; 1074*d.* Multiply by 4, and add the two farthings to the product; this will give the number of farthings, in 4*l.* 9*s.* 6½d.

£ *s.* *d.*
4 9 6½
20
89
12
1074
4
4298

Bring 4298 farthings to pounds.

Divide the farthings by 4, this will give 1074 pence and 2 farthings. Divide this by 12, and 89 shillings and sixpence is obtained. Divide by 20, and the quotient is 4 pounds 9 shillings. In all 4*l.* 9*s.* 6½*d.*

4)4298
12)1074-½
2,0) 8,9 6
£4 9 6-½

EXERCISES.

1. How many farthings are there in 12*l*. 7*s*. 6½*d*?
2. In 264*l*. 9*s*. 10*d*. how many pence?
3. Reduce 364*l*. 14*s*. 9½*d* to farthings.
4. In 247*l*. 12*s*. 8½*d*. how many halfpence?
5. How many pence are there in 276 guineas?
6. In 298 crowns, how many farthings?
7. Reduce 3648 sixpences to farthings.
8. In 42768 farthings how many pence?
9. How many pounds are there in 67890 shillings?
10. In 426876 farthings, how many pounds?
11. How many guineas are there in 36789 shillings?
12. In 68794 pence, how many crowns?
13. How many fourpences are there in 37689 shillings?
14. In 2470*l*. how many crowns?
15. How many pounds in 39076 half-crowns?
16. In 29685 twopences, how many shillings?
17. In 43687 crowns, how many threepences?
18. How many fivepences are there in 4796 crowns?
19. In 76971 halfpence, how many fourpences?
20. In 798302 pounds, how many sixpences?
21. How many crowns are there in 7968 guineas?
22. In 79201 half guineas, how many seven shilling pieces?
23. How many fivepences are there in 764 pounds?
24. In 73027 farthings, how many eightpences?
25. How many half-sovereigns are there in 7642 guineas?
26. Reduce 7632*l*. 17*s*. 0¾*d*. to farthings.
27. Reduce 3010*l*. 11*s*. 8*d*. to farthings.
28. In 7324 guineas, how many ninepences?
29. How often is three farthings contained in 742*l*. 17*s*. 9¾*d*.?
30. In 7690 fourpences, how many fivepences?

WEIGHTS AND MEASURES.

EXERCISES.

AVOIRDUPOIS WEIGHT.

ADDITION.

cwt.	*qrs.*	*lbs.*
4	2	12
2	3	14
6	1	7
3	2	24
17	2	1

(1)

cwt.	*qrs.*	*lbs.*
7	3	16
8	1	19
4	2	27
8	1	13

(2)

qrs.	*lbs.*	*oz.*
1	14	12
2	24	15
3	13	7
2	17	13

SUBTRACTION.

cwt.	*qrs.*	*lbs.*
16	2	12
12	3	24
3	2	16

(3)

cwt.	*qrs.*	*lbs.*
17	1	10
10	2	27

(4)

qrs.	*lbs.*	*oz.*
19	22	12
11	26	14

MULTIPLICATION.

cwt.	*qrs.*	*lbs.*
4	3	16
		4
19	2	8

(5)

cwt.	*qrs.*	*lbs.*
6	2	18
		7

(6)

qrs.	*lbs.*	*oz.*
2	23	12
		9

DIVISION.

	cwt.	*qrs.*	*lbs.*
3)	19	3	8
	6	2	12

(7)

	cwt.	*qrs.*	*lbs.*
6)	14	2	17

(8)

	qrs.	*lbs.*	*oz.*
9)	19	11	13

9. A tobacconist received 16 cwt. 2 qrs. 25 lb. of tobacco, nd sold 12 cwt. 3 qrs. 26 lb.; how much has he unsold?

10. A brewer bought five bags of hops; No. 1, weighed 1 cwt. 2 qrs. 14 lb.; No. 2, weighed 1 cwt. 3 qrs. 24 lb.; No. 3, weighed 1 cwt. 1 qr. 27 lb.; No. 4, weighed 1 cwt. 3 qrs. 26 lb.; No. 5, weighed 2 cwt. 2 qrs. 25 lb.; what was the weight of the whole?

11. A grocer sold the first year he was in business 64 cwt., 3 qrs. 26 lb. 14 oz. of sugar; the third year he was in business, he sold eight times as much; how much did he sell in the third year?

12. Eight hogsheads contained 168 cwt. 3 qrs. 26 lb. of sugar; how much did each contain?

13. A plantation produced the first year 376 cwt. 2 qrs. 16 lbs. of sugar; the second year 473 cwt. 1 qr. 9lbs. 15 oz.; the third year 698 cwt. 14 lbs. 12 oz.; the fourth year 568 cwt. 3 qrs. 13 oz.; the fifth year 737 cwt. 2 qrs. 13 lbs. 10 oz. 13 drams; how much sugar was produced on the plantation in these five years?

14. A grocer bought 3 hhds. of sugar, each containing 4 cwt. 1 qr. 13 lbs. The first month he sold 2 cwt. 3 qrs. 14 lbs. 13 oz.; the second month he sold 2 cwt. 2 qrs. 14 oz. 10 drams; the third month he sold 3 cwt. 1 qr. 11 lbs. 15 drams; how much has he on hand?

15. What is the weight of 36 hhds. of tobacco, each hhd. weighing 5 cwt. 3 qrs. 14 lbs. 13 oz.?

16. Eleven pieces of iron weighed 4 tons, 16 cwt. 3 qrs.; how much did each piece weigh?

17. Ten sacks of potatoes weighed 19 cwt. 3 qrs. 13 lbs. 14 oz.; what was the weight of each sack?

18. How many parcels, each containing 4½ lbs. can be made out of 2 cwt. 2 qrs. 23 lbs.?

19. If 36 bags of cotton, weighed 49 cwt. 3 qrs. 13 lbs., how much did one weigh?

20. How many hogsheads of sugar, each containing 13 cwt. 2 qrs. 14 lbs. may be put on board a ship of 324 tons burden?

21. St. Paul's bell in London weighs 5 tons 2 cwt. 1 qr. 22 lbs.; by how much does the great bell of Moscow exceed it, which weighs 198 tons 2 cwt. 1 qr.?

TROY WEIGHT.

MULTIPLICATION.

lbs.	*oz.*	*dwt.*
18	6	14
		4
74	2	16

(22)

lbs.	*oz.*	*dwt.*
24	3	12
		8

(23)

oz.	*dwt.*	*grs.*
43	5	14
		9

DIVISION.

	lbs.	*oz.*	*dwt.*
2)	17	7	14
	8	9	17

(24)

	lbs.	*oz.*	*dwt.*
4)	67	8	17

(25)

	oz.	*dwt.*	*grs.*
7)	43	16	22

26. A silversmith made three dozen spoons, weighing 5 lb. 9 oz. 8 dwt.; a tea-pot, weighing 3 lb. 2 oz. 16 dwt. 16 grs.; two pair silver candlesticks, weighing 4 lb. 6 oz. 17 dwt.; a dozen silver forks, weighing 1 lb. 8 oz. 19 dwt. 22 grs.; what was the weight of all the articles?

27. Three dozen silver table spoons weighed 5 lb. 9 oz. 8 dwt. while three dozen silver tea-spoons weighed only 1 lb. 9 oz. 16 dwt. 18 grs.; what was the difference in weight?

28. Sold eight silver tea-pots, each weighing 3 lb. 9 oz. 18 dwt. 13 grs.; how much did they all weigh?

29. A silver-smith received 36 lb. 8 oz. 14 dwt. 16 grs. of silver to make 12 tankards; what would the weight of each tankard be?

30. What is the weight of 36 ingots of silver, each ingot weighing 2 lb. 10 oz. 15 dwt.?

31. 2 lb. 4 oz. 9 dwt. of gold cost 59*l.* 16*s.* 6*d.*; what did it cost per dwt.?

32. What is the weight of 3 dozen spoons, each weighing 2 oz. 3 dwt. 19 grs.

LONG MEASURE.

ADDITION.

				(33)			(34)	
ml.	*fur.*	*per.*	*fur.*	*per.*	*yd.*	*per.*	*yd.*	*ft.*
4	6	20	7	22	2	16	3	2
6	5	13	6	22	4	17	4	1
7	4	9	9	16	3	24	5	0
6	7	12	6	14	5	23	2	2
26	0	14						

SUBTRACTION.

				(35)			(36)	
ml.	*fur.*	*per.*	*fur.*	*per.*	*yd.*	*per.*	*yd.*	*ft.*
4	6	20	7	10	1	16	2	1
1	7	35	2	19	4	12	4	2
2	6	25						

37. A man rode 35 miles, 2 furlongs, 34 perches; walked 24 miles, 6 furlongs, 25 perches, 2 yards; then rode again 42 miles, 7 furlongs, 4 yards; then walked again 15 miles, 4 furlongs, 38 perches, 3 yards; what was the length of his journey?

38. A traveller walked on Monday 32 miles, 5 furlongs; on Tuesday he walked 27 miles, 7 furlongs, 35 perches; how much did his journey of Monday exceed that of Tuesday?

39. A mail coach travelled at the rate of 7 miles, 5 furlongs, 25 perches, per hour; how far would it go in twelve hours?

40. A surveyor who had 19 miles, 7 roods, 36 perches, of road to keep in repair, appointed 12 men to the work; what length of road had each to attend to?

41. A man travelled in nine days 150 miles, 4 furlongs, 18 perches, 3 yards; how much did he travel per day on an average?

CLOTH MEASURE.

MULTIPLICATION.

			(42)			(43)		
yds.	*qrs.*	*nls.*	*yds.*	*qrs.*	*nls.*	*yds.*	*qrs.*	*nls.*
24	2	3	16	3	2	36	2	3
		4			7			9
98	3	0						

DIVISION.

			(44)			(45)		
yds.	*qrs.*	*nls.*	*yds.*	*qrs.*	*nls.*	*yds.*	*qrs.*	*nls.*
4)25	3	2	7)64	2	3	9)36	3	1
6	1	$3\frac{2}{4}$						

46. A tailor bought four pieces of cloth; in the first there were 27 yds. 2 qrs. 3 nls.; in the second, 39 yds. 2 qrs. 1 nl.; in the third, 32 yds. 3 qrs. 3 nls.; in the fourth, 47 yds. 3 qrs. 2 nls.; how much in all?

47. A tailor, from a piece of cloth containing 37 yds. 3 qrs. 2 nls. cut off 18 yds. 3 qrs. 2 nls.; how much remained?

48. A dozen weavers wove, each, 36 yds. 3 qrs. 3 nls. of cloth; how much was woven by the whole?

49. In nine pieces of cloth of equal length, there were 187 yds. 2 qrs. 3 nls. ; how much in each piece?

50. A piece of cloth at 7*s.* 6*d.* per yard, cost 17*l.* 12*s.* 6*d.* how many yards were there in it?

51. What is the difference in length of one web of cloth measuring 36 yds. 3 qrs. 3 nls. ; and two webs, each measuring 23 yds. 2 qrs. 2 nls.?

52. How many suits of clothes can be made from a piece containing 39 yds. 2 qrs. 3 nls.; each suit requiring 3 yds. 1 qr. 2 nls.?

SQUARE AND LAND MEASURE.

ADDITION.

				(53)			(54)	
ac.	*rd.*	*per.*	*ac.*	*rd.*	*per.*	*ac.*	*rd.*	*per.*
32	3	16	46	3	27	37	2	12
16	2	21	12	2	16	41	3	21
76	1	13	61	0	34	62	1	17
24	2	27	46	3	17	47	2	34
150	1	37						

SUBTRACTION.

				(55)			(56)	
ac.	*rd.*	*per.*	*ac.*	*rd.*	*per.*	*ac.*	*rd.*	*per.*
42	1	10	36	0	20	42	1	25
16	2	25	13	2	30	17	2	35
25	2	25						

57. I bought four fields; in the first there were 6 acres, 3 roods, 12 perches; in the second 7 acres, 2 roods; in the third 9 acres and 13 perches; in the fourth 5 acres, 2 roods, 36 perches. How much in all?

58. A farmer sowed with wheat, a field containing 18 acres, 2 roods, 25 perches; and another with oats, containing 19 acres, 3 roods, 34 perches. How much larger was one field than the other?

59. Eight men cut down a field of hay; each man cut 3 acres, 2 roods, 27 perches. How much was mown?

60. Twelve men ploughed a field containing 16 acres, 3 roods, 35 perches. How much did each plough?

61. In a field containing 241 acres, 3 roods, 16 perches; 176 acres, 2 roods, 23 perches were sown with wheat; the remainder of the field was sown with barley; how much was sown with barley?

62. Bought 96 acres, 3 roods, 17 perches of land, for which I pay 1764*l.*; what did I pay for it per perch

MEASURE OF CAPACITY.

MULTIPLICATION.

qrs.	*bush.*	*pk.*
7	6	2
		3
23	3	2

(63)

qrs.	*bush.*	*pk.*
27	7	3
		7

(64)

qrs.	*bush.*	*pk.*
49	5	2
		8

DIVISION.

	qrs.	*bush.*	*pk.*
2)	9	7	2
	4	7	3

(65)

	qrs.	*bush.*	*pk.*
4)	43	6	3

(66

	qrs.	*bush.*	*pk.*
9)	78	7	2

67. Sold to one man 27 qrs. 6 bushels, 3 pecks; to another 38 qrs. 4 bushels 2 pecks; to another 49 qrs. 6 bushels; and to another 58 qrs. 7 bushels 3 pecks; how much did I sell in all?

68. Lent a person 49 qrs. 2 bushels 1 peck. I have received from him 32 qrs. 3 bushels 3 pecks; how much does he still owe me?

69. John has 24 qrs. 3 bushels 2 pecks; but Tom has 10 times as much; how much has he?

70. I received 248 qrs. 6 bushels 3 pecks, and gave away a sixth part of it; how much did I give away?

71. What quantity of beer will be consumed in a year at the rate of 2 gallons 3 quarts 1 pint per day?

72. One cask contained 23 gallons 3 quarts 1 pint; another 37 gallons 2 quarts 3 gills; how much more did the one contain than the other?

73 Nine fields produced each on an average 24 loads 4 quarters 7 bushels 3 pecks; how much was the produce of the nine fields?

74. In 27 barrels there was on an average in each, 29 gallons, 3 quarts, 1 pint; how much in all?

TIME.

ADDITION.

				(75)			(76)	
yrs.	*wks.*	*dys.*	*yrs.*	*wks.*	*dys.*	*dys.*	*hrs.*	*min.*
24	6	3	27	36	4	35	17	6
12	16	5	43	12	4	24	18	14
41	24	4	74	43	6	52	12	5
32	13	6	27	18	5	64	13	3
110	9	4						

SUBTRACTION.

				(77)			(78)	
yrs.	*wks.*	*dys.*	*yrs.*	*wks*	*dys.*	*dys.*	*hrs.*	*min.*
43	4	2	32	3	4	47	12	10
24	6	5	16	7	6	17	20	40
18	49	4						

79. The bricklayers were engaged about a house 23 weeks, 4 days, and 8 hours; the carpenters 14 weeks, 6 days, and 9 hours; the painters 12 weeks, 5 days, 7 hours, and 34 minutes; the upholsterer 5 weeks, 10 hours, and 42 minutes; how long were these different workmen engaged about the house?

80. Two vessels sailed for America; one of them was 9 weeks, 6 days, and 14 hours on the voyage; the other got to America in 7 weeks, 5 days, and 19 hours; how much less time did the one go in than the other?

81. I can go to a certain town by the rail-way in 9 hours, 25 minutes, and 30 seconds; it would take me, at least, five times as long to go by the stage coach; how long would the coach take?

82. There are 365 days, 5 hours, 48 minutes, 57 seconds. in a solar year; how much is there in a twelfth of it?

83. How many seconds has a boy lived, who is 11 years old?

REDUCTION.

AVOIRDUPOIS WEIGHT.

1. In 7 cwt. 2 qrs. 14 lbs.; how many pounds?

2. In 3 qrs. 13 lbs., 12 oz.; how many ounces?

3. How many pounds are there in 1427 oz.?

4. Bought 24 bags of hops, each weighing 2 cwt. 2 qrs. 13 lbs.; how many pounds in the whole?

5. In 3 cwt. 2 qrs. 14 lbs. of sugar; how many parcels are there, each containing half a pound?

TROY WEIGHT.

6. In 24 lbs. of gold; how many pennyweights?

7. In 2468 grains of gold dust; how many ounces?

8. In a silver snuff-box weighing 10 oz. 16 dwt.; how many grains?

9. How many silver table spoons, each weighing 4 oz. 16 dwt., can be made out of 2 lbs. 8 oz. 13 dwt. of silver?

10. What quantity of gold will it require to make twelve gold ornaments, each weighing 1 oz. 18 dwt. 12 gr.?

11. A gentleman sent a silver tankard to a silversmith, and ordered him to make it into spoons, each to weigh 2 oz. 12 dwt.; how many spoons did he make, the tankard weighing 4 lbs. 7 oz.?

APOTHECARIES' WEIGHT.

12. In 4 lbs. 8 oz. 4 drams. 2 scr.; how many grains?

13. In 2487 grains, how many ounces?

14. In 7 ounces, 5 drams, 3 scruples; how many scruples?

15. A patient is required to take daily 2 drams, 2 scruples of bark; how long will 7 lbs. of bark last him?

LONG MEASURE.

16. In 76 miles, 6 furlongs; how many perches?

17. In 47968 inches; how many yards

18. From Dublin to Liverpool is about 38 leagues; how many yards is it?

19. From Dublin to Cork is about 130 miles; how often does a coach-wheel turn round between the two places, the circumference of the wheel being 12 feet?

20. From Dublin to Belfast is about 90 miles; how often does a coach-wheel turn round between the two places, the circumference of the wheel being 12 feet?

CLOTH MEASURE.

21. In 246 yards, how many nails?

22. In 4786 nails, how many yards?

23. From a piece of linen containing 24 English ells, how many shirts can be made, each requiring 3½ yards?

24. How many suits may be made from 26 yds. 2 qrs. each suit containing 3½ yards?

MEASURE OF CAPACITY.

25. In 24 gallons, 2 quarts, 1 pint; how many pints?

26. In 4687 pints; how many gallons?

27. In 24 loads, 5 bushels, 3 pecks; how many pecks?

28. How many bushels are there in 4796 pecks?

29. In a hogshead of wine containing 63 gallons, how many gills are there?

TIME.

30. In 6 weeks, 3 days, 14 hours; how many hours are there?

31. In 74697 minutes; how many days?

32. How many minutes has a boy lived, who is 10 years and 6 weeks old?

33. A clock strikes 156 times during the day; how often does it strike in 6 years?

SIMPLE PROPORTION.

When we have three numbers given, this rule teaches how to find a fourth number, which may have the same proportion to the third number, that the second has to the first.

Thus, if the three given numbers be 1, 2, 3, it is required to find a fourth number which will have the same proportion to 3 that the 2 has to 1; now, the 2 is double the 1; therefore, the required number must be double of the 3, that is 6. To express proportion the numbers are put down thus, 1 : 2 : : 3 : 6, and are read thus, 1 is to 2 as 3 is to 6.

Case I.—*To find out a fourth proportional to three given numbers.*

Find a fourth proportional to the numbers 4, 8, 6.

Rule with Example.—Place them thus, and multiply the second and third numbers together, and divide by the first; the quotient is 12, which bears the same proportion to 6 that 8 does to 4.

$$\begin{array}{r} 4 : 8 :: 6 : \\ 6 \\ 4)\overline{48} \\ \overline{12} \end{array}$$

	Ans.
To 3, 6, 12, find a fourth proportional	24.
To 6, 8, 3, find a fourth proportional	4.
To 3, 6, 8, find a fourth proportional	16.
To 6, 12, 4, find a fourth proportional	8.
To 10, 150, 68, find a fourth proportional	1020.
Find a fourth proportional to 1020, 68, 150	10.
Find a fourth proportional to 150, 10, 1020	68.
Find a fourth proportional to 68, 1020, 10	150.

Find a fourth proportional to the following numbers:—

	Ans.
To 2 tons, 17 tons, and 25*l*	212*l*. 10*s*.
To 10 lb., 150 lb., and 5*s*	75*s*.
To 9 yds., 36 yds., and 18*s*	72*s*.
To 5 lb., 1 lb., and 15*s*	3*s*.
To 4 yds., 18 yds., and 2*s*	9*s*.
To 1 cwt., 215 cwt, and 50*s*	10750*s*.
To 5 tons, 50 tons, and 27*l*	270*l*.

Case II.—*When the two first terms are of different denominations reduce them to the same.*

To 1 oz., 112 lbs., and 2s., find a fourth proportional.

Rule with Example.—Multiply the 112 lbs. by 16, to bring them to the same as the first term—viz., to ounces. When this is done the numbers stand thus—3 oz. 1792 oz. 2*s*.

oz. *lb.* *s.*
3 : 112 : 2
16
672
112
1792
2
3)3584
1194,2

Find the fourth proportional to the following numbers:—

Ans.
To 2 qrs., 240 yds., 12*s*..................5760*s*.
To 5*s*. 80*l*., 1 yd..............................320 yds.
To 5 cwt., 6000 lbs., 8*s*......................85*s*. 400 remains.
To 5*s*. 6*d*., 140*s*., 2 yds......................50 yds. 60 remains.
To 3*s*. 4*d*., 1*l*. 10*s*., 1 yd.......................9 yds.

Case III.—*When the third term is of a different denomination reduce it to the lowest.*

To 2 lbs., 112 lbs., and 5*s*. 6*d*., find a fourth proportional.

Rule with Example.—Multiply the 5*s*. by 12 adding the 6*d*. It then stands thus: 2 lbs. 112 lbs. 66*d*. Proceed as formerly.

lbs. *lbs.* *s.* *d.*
2 : 112 :: 5 6 :
66 12
672 66
672
2)7392
3696 pence.

Find the fourth proportional to the following numbers:—

Ans.
To 2 tons, 14 tons, 28*l*. 10*s*...............3990*s*.
To 5 brls., 100 brls., 18*s*. 6*d*.............4440*d*.
To 4 lbs., 112 lbs., 5¼*d*....................588 farthings.

If 24 lbs. of butter cost £1 8*s*., what is the price of 3 lbs.?

Rule with Example.—In this question there are two things mentioned—butter and money. Is the answer to the question to be given in butter or money? You see at once it is to be given in money. Put down the money, 1*l*. 8*s*., for the third term. Having done this, you have now to consider where you are to place the 24 lbs. and the 3 lbs. Read over the question, and you will see that the answer must be less than the third term; for 3 lbs. will not cost so much as 24 lbs. If, then, the answer is to be less, put the less number for the second term, and the greater for the first. In all questions let the third term be the same as the answer; and if the answer is to be greater than the third term, put the *greater* second; if it is to be less, put the *less* second.

$$\begin{array}{llr}
\textit{lbs.} & \textit{lbs.} & \pounds\quad s. \\
24 : & 3 :: & 1\quad 8 \\
 & & 20 \\
 & & \overline{28} \\
 & & 3 \\
 & & 24\left\{\begin{array}{r} 2)\overline{84} \\ 12)\overline{42} \end{array}\right. \\
 & & \overline{3s.\ 6d.}
\end{array}$$

1. If 2 lbs. of tea cost 9*s*.; what will 24 lbs. cost?

2. If 4 lbs. of coffee cost 8*s*. 8*d*.; what will 36 lbs. cost?

3. If 8 yds. of cloth cost 4*l*. 16*s*. 6*d*.; what will 74 yds. cost?

4. Bought 2 pair of boots for 1*l*. 18*s*. 8*d*.; what will 46 pair cost?

5. Bought 2 oz. of tea for 7¾*d*.; what is that per lb.?

6. Bought 15 lbs. of sugar for 9*s*. 10*d*.; what was the price per cwt.?

7. A person spends 2*l*. 16*s*. 8*d*.; per week; how much is that per annum?

8. 3 qrs. 24 lbs. of sugar cost 4*l*. 16*s*. 8*d*.; how much is that per cwt.?

9. If 9*s*. 3½*d*. will buy 14 lbs. of sugar; how much will 3*s*. 6*d*. buy?

10. If 24 yds. cost 3*l*. 14*s*. 7*d*; how much must I give for 1 yd. 3 qrs. 2 nls.?

11. What cost 5 hogsheads of sugar each weighing 14 cwt. 2 qrs. 24 lbs., at 2*l*. 13*s*. 6*d*. per cwt.?

12. If for 7*s*. 8*d*. I can buy 9 lbs. of raisins; how much I purchase for 56*l*. 16*s*.?

13. A bankrupt owes 4968*l.*; but he has only money sufficient to pay 9*s.* 7*d.* for every pound he owes: how much money has he to pay his debts?

14. A pole 6 feet high throws a shadow of 5 feet 8 inches; what is the height of a spire which throws a shadow of 156 feet?

15. If 54 men can build a house in 90 days; how many men would it require to do it in 12 days?

16. A grocer bought 6 cwt. 3 qrs. 26 lbs. of sugar, for which he paid 24*l.* 16*s.* 8*d.*; at what rate per pound must he sell it to gain 4*l.* 10*s.* 4*d.* on the whole?

17. A person reaches a certain place in 18 days by walking 8 hours a day; what number of days would he have taken had he walked 12 hours a day?

18. If 14 men could make a ditch in 18 days; in what time could 34 men do it?

19. A ship was provisioned for a crew of 40 for 3 months; how long would these provisions last, if the crew were reduced to 32 men?

20. If 8 horses can subsist on a certain quantity of hay for 2 months; how long would 12 horses subsist on the same quantity?

21. A field of corn was to be cut down by 40 men in 10 days; ten of the men, however, did not make their appearance: in what time would the field be cut down?

22. If for 24*s.* I can have 1200 lbs. carried 36 miles; how many pounds can I have carried 24 miles for the same money?

23. A tea dealer bought 4 chests of tea, each weighing 37 lbs 7 oz., for 63*l.* 14*s.* 6*d.*; what did the tea cost him per ounce?

24. If 74 gallons of wine cost 52*l.* 17*s.* 9½*d.*; how much will 16 gallons cost?

25. If 4 lbs. of tea cost 24*s.* 8*d.*; how much may be bought for 42*l.* 7*s.* 8*d.*?

26. If 3 cwt. 2 qrs. 16 lbs. of sugar cost 13*l.* 17*s.* 9*d.*; what is the value of 19 cwt. 3 qrs. 14 lbs.?

COMPOUND PROPORTION.

When, in order to find a fourth proportional, several circumstances require to be considered, it is called Compound Proportion.

If 14 horses eat 56 bushels of oats in 16 days; how many bushels will be required for 20 horses for 24 days?

Rule with Example.—Write down for the third term that number which is of the same kind with the answer required—56 bushels. Then take two numbers of the same kind—14 horses and 20 horses—and consider, as in Simple Proportion, whether from the nature of the question, the greater or less is to be put in the first or second term. Here it is obvious that the greater must be in the second term, as 20 horses will eat more than 14 horses. Take the other two terms and proceed in the same manner. After all the terms have been put down, multiply the two first terms, 14 and 16, together; do the same with the two second terms, 20 and 24, and proceed as in Simple Proportion.

$$\begin{array}{lrcrl}
 & & & & \text{bush.} \\
\text{horses} & 14 & : & 20 & :: 56 \\
\text{days} & \underline{16} & : & \underline{24} & \\
 & 224 & & 480 & \\
 & & & \underline{56} & \\
 & & & 2880 & \\
 & & & 2400 & \\
 & & & \overline{224)26880(120} & \text{bus.} \\
 & & & \underline{224} & \\
 & & & 448 & \\
 & & & \underline{448} & \\
 & & & 0 &
\end{array}$$

Contraction.—Let the question be the same as in the last example.

After the terms have been properly arranged, the operation may often be greatly shortened by using the following method: Draw a line, and place the first terms, 14 and 16, under it, and the second and third terms, 20, 24, and 56, above it; then divide any number above the line and any below any number which will divide both without leaving a

$$\frac{\overset{10}{\cancel{20}} \times \overset{3}{\cancel{24}} \times \overset{\overset{4}{\cancel{8}}}{\cancel{56}}}{\underset{\cancel{2}}{\cancel{14}} \times \underset{\cancel{2}}{\cancel{16}}}$$

remainder. Thus, 14 below and 56 above may both be divided by 7; divide by it, and place the figures obtained below and above the 14 and 56, drawing your pencil at the same time through the 14 and 56. Again, you see that 16 and 24 may be divided by 8; draw your pencil through them, and write the numbers above and below, then cancel the 20 and the 2; then the 8 and the other 2. Multiply all the figures that remain above the line and divide the product by the product of all the figures under the line, if any, for the answer: thus, $10\times3\times4=120$. This is the answer as there are no figures below the line by which to divide.

1. If 15 men build 37 roods of wall in 27 days, how many roods will 74 men build in 63 days?

2. If 8 men for 5 days' work get 40*s.*; how much ought 32 men to get for 24 days' work.

3. If 4 men can mow 20 acres of grass in 7 days; how many acres can 12 men mow in 28 days?

4. If 6 tailors can make 10 suits of clothes in 4 days; how many suits can 20 make in 7 days?

5. A wall, 28 feet in height, was built in 15 days by 68 men; how many men working at the same rate could build a wall 32 feet high in 8 days?

6. If 12 horses in 5 days draw 44 tons of stones from a quarry; how many horses would it require to draw 132 tons in 18 days?

7. A garrison of 1500 men has provisions for 12 weeks, at the rate of 20 ounces per day to each man; how many men will the same provisions maintain for 20 weeks, allowing each man only 8 oz. per day?

8. If 50 men can do a piece of work in 100 days, working 8 hours per day; in what time will 120 men do it, working 6 hours per day?

9. What is the interest of 330*l.* 10*s.* for 2½ years at 4½ per cent per annum?

10. If 600*l.* gain 45*l.* in 18 months; how much will 103*l.* gain in 12 months?

BILLS OF PARCELS.

A Bill is a written account of goods purchased, or work performed.

A Bill of Parcels is that which is delivered with the goods at the time of purchase.

BOOKSELLER'S BILL.

Mr. John Thompson

Bought of Curry and Co.

1836.
January 17.

	£	s.	d.
Cowper's Poetical Works, ...	0	5	6
Bonnycastle's Algebra, ...	0	7	0
Norie's Navigation, ...	0	16	0
Plutarch's Lives, 6 vols., ...	2	12	6
Hutton's Mathematics, 3 vols., ..	1	11	6
Lardner's Arithmetic, ...	0	6	0
	£		

HOSIER'S BILL.

Mrs. Young

Bought of Patrick Murphy.

1836.
Decem. 16.

		s.	d.		
5 Pair of Worsted Stockings,	@	3	8	℘	pair
6 yards of Flannel,	„	1	9	„	yard
4 Pair of Gloves,	„	2	6	„	pair
8 Pair Thread Stockings,	„	2	9	„	„
6 Pair Cotton do.	„	2	7	„	„
				£	

GROCER'S BILL.

Mrs. Young

Bought of John Dickson.

1836.
July 16.

		s.	d.	
12 lbs. of Loaf Sugar,	@	0	10	℘ lb.
9 lbs. of Green Tea,	„	12	0	„
6 lbs. of Turkey Coffee,	„	2	6	„
8 lbs. of Hyson Tea,	„	8	6	„
16 lbs. of Soft Sugar,	„	0	8	„
14 lbs. of Rice,	„	0	4	„
15 lbs. of Currants,	„	0	11	„
				£

BILLS OF BOOK DEBTS.

A Bill of Book Debts is a statement of debts formerly contracted. The following is the manner in which it ought to be copied from the tradesman's books:—

WINE MERCHANT'S BILL.

Mr. Thos. Robinson

To Wm. Anderson.

1836.			£	s.	d.	
May 24.	To 4 dozen Port,	@	1	18	6	℘ doz.
„ 28.	— 3½ „ Sherry,	„	1	16	0	„
June 13.	— 3 „ Claret,	„	2	18	0	„
July 19.	— 4½ „ Burgundy,	„	3	10	0	„
„ 24.	— 1 „ Champagne,	„	3	18	0	„
Sept. 19.	— 4 gals. Brandy,	„	1	2	0	℘ gal.
„ 27.	— 3 „ Hollands,	„	1	1	0	„
						£

PRACTICE.

Practice is an abridged mode of performing operations in the rule of Simple Proportion; and is so named because it is much used by people in business.

A less number is said to be the aliquot part of a greater, when the less number is contained in the greater any number of times without leaving any remainder: thus 3 is the aliquot part of 9 or of 15, and 4 of 16 or of 20.

TABLE OF ALIQUOT PARTS.

Of a Pound

s.	d.		
10	0	is	$\frac{1}{2}$
6	8	-	$\frac{1}{3}$
5	0	-	$\frac{1}{4}$
4	0	-	$\frac{1}{5}$
3	4	-	$\frac{1}{6}$
2	6	-	$\frac{1}{8}$
2	0	-	$\frac{1}{10}$
1	8	-	$\frac{1}{12}$
1	4	-	$\frac{1}{15}$
1	3	-	$\frac{1}{16}$
1	0	-	$\frac{1}{20}$

Of a Pound

d.		
10	is	$\frac{1}{24}$
8	-	$\frac{1}{30}$
7½	-	$\frac{1}{32}$
6	-	$\frac{1}{40}$
5	-	$\frac{1}{48}$
4	-	$\frac{1}{60}$
3	-	$\frac{1}{80}$
2	-	$\frac{1}{120}$
1½	-	$\frac{1}{160}$
1	-	$\frac{1}{240}$

Of a Shilling

d.		
6	is	$\frac{1}{2}$
4	-	$\frac{1}{3}$
3	-	$\frac{1}{4}$
2	-	$\frac{1}{6}$
1½	-	$\frac{1}{8}$
1	-	$\frac{1}{12}$
0¾	-	$\frac{1}{16}$
0½	-	$\frac{1}{24}$
0¼	-	$\frac{1}{48}$

Of a Ton

cwt.		
10	is	$\frac{1}{2}$
5	-	$\frac{1}{4}$
4	-	$\frac{1}{5}$
2½	-	$\frac{1}{8}$
2	-	$\frac{1}{10}$
1	-	$\frac{1}{20}$

Of a Cwt.

qr.	lbs.		
2	0	is	$\frac{1}{2}$
1	0	-	$\frac{1}{4}$
0	16	-	$\frac{1}{7}$
0	14	-	$\frac{1}{8}$
0	8	-	$\frac{1}{14}$
0	7	-	$\frac{1}{16}$

Of a Quarter

lb		
14	is	$\frac{1}{2}$
7	-	$\frac{1}{4}$
4	-	$\frac{1}{7}$
3½	-	$\frac{1}{8}$
2	-	$\frac{1}{14}$
1	-	$\frac{1}{28}$

Case I.—*When the price is less than a penny.*

Rule.—Divide by the aliquot parts of a penny, as this will give the answer in pence; divide then by 12 and by 20, to obtain the value in shillings and pounds.

What is the price of 4268 pencils, at ½*d.* each?

½ = ½)4268
12)2134
2,0)17,7–10
£8 17*s.* 10*d.*

What is the price of 4268 pencils, at ¾*d.* each?

½ = ½)4268
¼ = ½)2134
1067
12)3201
2,0)26,6–9
£13 6*s.* 9*d.*

1. What is the value of 6486 yards of tape, at ¼*d.* per yard?

2. How much will 3684 slate pencils come to, at ½*d.* each?

3. I bought 368 yards of black ribbon at ¾*d.* per yard; what did it cost me?

4. Bought 8 dozen of herrings at ½*d.* each; how much did I give for the herrings?

5. How much did 428 yards of rope cost me at ¾*d.* per yard?

Case II.—*When the price is less than a shilling.*

Rule.—Take the aliquot parts of a shilling, and divide by 20.

What is the value of 4608lbs. of soap, at 3½*d.* per lb.?

d.
3 = ¼)4608
½ = ⅙)1152
192
2,0)134,4
£67 4*s.* *Ans.*

What is the value of 4608 lbs. of sugar, at 6½*d.* per lb.?

d.
6 = ½)4608
½ = 1/12)2304
192
2,0)249,6
£124 16*s.* *Ans.*

6. What do 784 yards of canvas come to, at 2½*d.* per yard?

7. Bought 856 yards of ribbon, for which I paid 8½*d.* per yard; how much did I pay?

8. Sold 1 cwt. of sugar at 9¾*d.* per lb.; how much was paid me?

9. Bought 7896 lbs. of candles for 5½*d.* per lb.; what did they cost me?

10. A fruiterer sold 3968 lbs. of raisins at 10¼*d.* per lb.; how much did he get for all?

d.
11. 6423 at 1
12. 3684 — 1¼
13. 2786 — 1½
14. 5963 — 1¾
15. 4285 — 2
16. 6786 — 2¼
17. 4388 — 2½
18. 8653 — 2¾

d.
19. 7568 at 3
20. 8543 — 3¾
21. 2758 — 4¼
22. 5623 — 4½
23. 4278 — 5¾
24. 6496 — 6½
25. 4378 — 6¾
26. 4021 — 7½

d.
27. 8642 at 8¼
28. 7643 — 8¾
29. 8765 — 9
30. 2011 — 10½
31. 4076 — 10¾
32. 3687 — 11¼
33. 2734 — 11½
34. 3016 — 11¾

Case III.—*When the price is shillings.*

Rule.—Multiply by the shillings, and divide by 20; or if the shillings be the aliquot part of a pound, divide by the aliquot part.

What is the price of 467 yards of cloth, at 7*s.* per yard?

467
7
2,0)$\overline{326,9}$
£$\overline{163,}$ 9*s.* *Ans.*

How much do 684 lbs. of tea come to at 8*s.* per lb.?

684
8
2,0)$\overline{547,2}$
£ $\overline{273,}$ 12*s.* *Ans.*

What is the price of 246 yards of cloth at 10*s.* per yard?

10s. = ½)246
£ $\overline{123}$ *Ans.*

How much do 684 lbs. of tea come to at 5*s.* per lb.?

5s. = ¼)684
£ $\overline{171}$ *Ans.*

When the price is an even number of shillings, the operation may be shortened by multiplying by half the number of shillings, and doubling the unit's place for shillings.

What is the price of 468 yards, at 8*s*. per yard?

yds.
468
4
£187 4*s*. *Ans.*

What is the price of 967 yards of cloth at 14*s*. per yard?

yds.
967
7
£676 18*s*. *Ans.*

35. What must I pay for 796 yds. of cloth at 13*s*. per yd.

36. A fruiterer bought 148 boxes of oranges, and paid for each box 16*s*.; how much did he pay for all?

37. Bought 12 dozen pair of shoes, and paid for them 10*s*. per pair; what did they cost?

38. A farmer bought 968 sheep, and gave for each 18*s*. how much did he give for all?

39. Bought 9 doz. hats, at 15 shillings each; what did the whole cost?

40. How much must I pay for the carriage of 748 tons of goods, at 18*s*. per ton?

41. Bought 763 cwt. of sugar at 16*s*. per cwt.; how much did I pay for the whole?

42. Sold 12 dozen pairs of silk stockings at 9*s*. per pair; what sum did I receive for the whole?

			s.				*s.*
43.	6428	at	2	52.	5768	at	11
44.	9460	—	3	53.	2104	—	12
45.	7568	—	4	54.	6013	—	13
46.	3675	—	5	55.	7617	—	14
47.	4103	—	6	56.	2016	—	15
48.	2602	—	7	57.	3687	—	16
49.	3604	—	8	58.	1209	—	17
50.	8756	—	9	59.	4123	—	18
51.	3601	—	10	60.	7641	—	19

Case IV.—*When the price is shillings and pence.*

Rule.—If the price be the aliquot part of a pound, divide by the aliquot part. If it be not an aliquot part, multiply by the shillings, and take aliquot parts of a shilling for the pence and farthings.

What is the price of 964 lbs. of tea, at 6*s*. 8*d*. per lb. ?

$$6s.\ 8d. = \tfrac{1}{3})\underline{964}$$
$$\pounds 321\ \ 6s.\ 8d.$$

What is the price of 268 yds. of cloth, at 7*s*. 6½*d*. per yard ?

$$\begin{array}{rrr} 6d. = \tfrac{1}{2}) & 268 & \\ & 7 & \\ \hline & 1876 & \\ \tfrac{1}{2} = \tfrac{1}{12}\ ) & 134 & \\ & 11 & 2 \\ \hline 2,0) & 202,1 & 2 \\ \hline & \pounds 101\ \ 1s. & 2d. \end{array}$$

61. Paid 2*s*. 4*d*. per yard for 768 yards of ribbon; how much did I pay?

62. Received a chest of tea containing 278 lbs., for which I paid 6*s*. 8½*d*. per lb.; what did the whole cost me?

63. A hosier bought 8 dozen pairs of silk stockings, for which he paid 6*s*. 9¾*d*. per pair; what did he pay in all?

64. A boot maker sold, during the year, 279 pairs of boots, at 18*s*. 10½*d*. per pair on an average; how much money did he get for the boots during the year?

65. Two tailors sold, during the year, 168 suits of boys' clothes, for which they were paid at the rate of 17*s*. 9½*d*. per suit; how much did they get during the year?

			s.	*d*.				*s*.	*d*.
66.	3468	at	3	6	75.	1201	at	12	10
67.	4976	—	4	7	76.	2768	—	13	7½
68.	5048	—	6	3½	77.	6475	—	14	9¾
69.	3162	—	5	8¾	78.	4687	—	15	7
70.	7643	—	8	7	79	9621	—	16	9¼
71.	5736	—	9	4¾	80	4103	—	17	8¾
72.	3987	—	9	8¼	81	2464	—	18	4¼
73.	6426	—	10	6¼	82.	3102	—	18	5½
74.	8650	—	11	9½	83.	6765	—	19	7¼

Case V.—*When the price is pounds, shillings, pence, and farthings.*

Rule.—Multiply by the pounds, and take aliquot parts for the rest.

What is the value of 248 chests of tea at 9*l.* 17*s.* 8*d.* per chest?

10*s.* $= \frac{1}{2}$) 248
9
2232
5*s.* $= \frac{1}{2}$) 124
2*s.* 6*d.* $= \frac{1}{2}$) 62
2*d.* $= \frac{1}{15}$) 31
2 1 4
£2451 1*s.* 4*d.* *Ans.*

or thus:

10*s.* $= \frac{1}{2}$) 248
9
2232
6*s.* 8*d.* $= \frac{1}{3}$) 124
1*s.* $= \frac{1}{10}$) 82 13 4
12 8 0
£2451 1*s.* 4*d.* *Ans.*

84. How much do 268 cwt. of sugar come to at 2*l.* 6*s.* 8*d.* per cwt.?

85. What rent do 796 acres yield at 3*l.* 14*s.* 6½*d.* per acre?

86. What did 279 score of sheep cost at 6*l.* 18*s.* 9*d.* per score?

87. How much did a grocer pay for 948 cwt. of sugar at 3*l.* 17*s.* 6¾*d.* per cwt.?

88. A watchmaker sold 796 watches for 9*l.* 12*s.* 6*d.* each; how much did he sell all for?

			l.	*s.*	*d.*
89.	7964	at	7	9	6
90.	4679	—	8	17	8
91.	8742	—	4	16	5½
92.	2598	—	9	12	8¼
93.	8764	—	10	17	6¾
94.	2687	—	12	14	7
95.	9648	—	8	11	4½
96.	2784	—	11	10	2
97.	7204	at	12	16	7
98.	4121	—	13	14	8
99.	3145	—	14	17	9¼
100.	6876	—	15	19	7
101.	9684	—	16	18	6¾
102.	7780	—	17	13	4
103.	4627	—	18	14	5
104.	794	—	28	9	6½

Case VI.—*When both the quantity and price are of several denominations.*

Rule.—Multiply the *price* by the highest name in the quantity, and take parts for the rest of the quantity.

What is the price of 3 cwt. 2 qrs. 7 lbs. of sugar at 3*l*. 6*s*. 8*d*. per cwt.?

qrs.	£	*s.*	*d.*
2 = ½)	3	6	8
			3
lbs.	10	0	0
7 = ⅛)	1	13	4
	0	4	2
	£11	17*s*.	6*d*.

What is the value of 25 cwt. 2 qrs. 14 lbs. at 3*l*. 17*s*. 6*d*. per cwt.?

qrs.	£	*s.*	*d.*	
2 = ½)	3	17	6	
			5	5×5=25
	19	7	6	
			5	
lbs.	96	17	6	
14 = ¼)	1	18	9	
	0	9	8¼	
	£99	5	11¼	

105. Sold 5 cwt. 1 qr. 8 lbs. of sugar at 3*l*. 15*s*. 8*d*. per cwt.; what did I get for the whole?

106. Bought 72 cwt. 2 qrs. 14 lbs. tobacco at 4*l*. 16*s*. 8*d*. per cwt.; what did the whole cost?

107. Bought 96 cwt. 3 qrs. 8 lbs. soap, at 3*l*. 12*s*. 8*d*. per cwt.; how much did I pay for the whole?

108. Sold 27 cwt. 3 qrs. 14 lbs. cheese at 1*l*. 10*s*. 6*d*. per cwt.; what does the whole come to?

109. Bought 29 cwt. 2 qrs. 14 lbs. at 4*l*. 16*s*. 8d. per cwt.; what did I pay?

	cwt.	*qrs.*	*lbs.*		£	*s.*	*d.*
110.	24	2	7	at	2	16	7
111.	14	1	8	—	3	14	6
112.	7	3	6	—	4	15	8
113.	16	2	18	—	5	14	9
114.	27	1	16	—	6	13	2
115.	32	2	14		7	19	8

	cwt.	*qrs.*	*lbs.*		£	*s.*	*d.*
116.	35	1	8	at	6	10	6
117.	36	2	7	—	4	12	8½
118.	40	3	9	—	9	16	1¼
119.	42	2	16	—	8	14	7
120.	45	1	14	—	9	15	6¾
121.	48	2	4	—	4	17	8

Case VII.—*When the quantity contains a fraction.*

Rule.—Work for the whole number by the preceding rules, and to the result add the ½ or ⅗ or ⅘ of the price, or whatever else the fraction in the quantity may be. The sum to be added may be obtained by multiplying the price by the upper figure of the fraction, and dividing by the under figure.

What is the value of 246⅗ cwt. of sugar at 3*l.* 10*s.* 6*d.* per cwt. ?

10*s.* = ½)246	The value of the fraction is found thus :
3	*l.* *s.* *d.*
738	3 10 6
6*d.* = $\frac{1}{20}$) 123	2
6 3	5)7 1 0
⅗ = 1 8 2¼–⅗	£1 8 2¼–⅗
£868 11 2¼–⅗	

122.	4786½	@ £3	10	6		128.	7426⅚	@ £6	15	9
123.	7641⅓	— 4	9	7		129.	3278⅜	— 2	12	6
124.	8469⅔	— 0	8	6		130.	4625$\frac{2}{7}$	— 0	14	7½
125.	4210¾	— 0	5	7¾		131.	2010⅗	— 6	16	9
126.	8659⅞	— 0	7	11¼		132.	3607⅛	— 8	19	8½
127.	4286⅘	— 9	12	6½		133.	1243$\frac{2}{9}$	— 3	17	7

TARE AND TRET

Gross Weight means the weight both of goods and package, whether these packages be barrels, boxes, or sacks.

Tare is an allowance made to purchasers for the weight of the package.

Tret is an allowance of 4 lbs. on every 104 lbs. of goods, for waste, or $\frac{1}{26}$ part of the whole.

Cloff is an allowance of 2 lbs. on every 3 cwt. made to those who retail goods for turning the scales.

Suttle is what remains after part of the allowance is taken from the gross.

Case I.—*When an allowance is made for the tare per barrel, box, or sack.*

What is the net weight of 4 hogsheads of sugar, each weighing 13 cwt. 3 qrs. 14 lbs.; the tare being 1 qr. 10 lbs. per hhd.?

cwt.	*qrs.*	*lbs.*		*qr.*	*lbs.*
13	3	14		1	10
		4			4
55	2	0	1	1	12
1	1	12			
54	0	16			

Rule with Example.—Multiply the weight of each hhd. by 4, to find the gross weight of the whole, 55 cwt. 2 qrs.; then multiply the tare upon each hhd., 1 qr. 10 lbs., by the number of hhds., 4, and you find the tare upon the 4 hhds. to be 1 cwt. 1 qr. 12 lbs.; place this under the gross of the 4 hhds., 55 cwt. 2 qrs., and subtract. The remainder, 54 cwt. 0 qr. 16 lbs., is the net weight.

1. What is the net weight of 9 chests of tea, each weighing wt. 2 qrs. 19 lbs.; tare 18 lbs. per chest?

2. What is the net weight of 6 chests of tea, each weighing 1 cwt. 3 qrs. 9 lbs.; tare 18 lbs. per chest?

Case II.—*When the tare is so much per cwt.*

Gross weight 173 cwt. 3 qrs. 17 lbs.; tare 16 lbs. per cwt. what is the net weight?

lb.		*cwt.*	*qrs.*	*lbs.*
14	= ⅛)	173	3	17
2	= ⅐)	21	2	26
		3	0	11
		24	3	9
		149	0	8

Rule with Example.—Divide the gross weight, 173 cwt. 3 qrs. 17 lbs., by the aliquot part of a cwt.: thus, 14 lbs. is the ⅛ of a cwt.; divide by ⅛; again, 2 lbs. is the ⅐ of 14 lbs.; divide by ⅐; add the two quotients together, and 24 cwt. 3 qrs. 9 lbs. are obtained; let this be taken from the gross weight, 173 cwt. 3 qrs. 17 lbs., and 149 cwt. 0 qr. 8 lbs. are obtained, which is the net weight. The remainders have not been attended to in this question, as they are not necessary in order to understand it.

3. What is the net weight of 7 hhds. of sugar, each 6 cwt. rs. 14 lbs. gross; tare 12 lbs. per cwt.?

4. What is the net weight of 8 hhds. of tobacco, each 3 cwt. 2 qrs. gross; tare 18 lbs. per cwt.?

5 The gross weight of 50 casks of butter is 202 cwt. 2 qrs. 12 lbs.; tare 15 lbs. per cwt.; what is the net weight?

Case III.—*When allowance is to be made both for tare and tret.*

What is the net weight of 4 cwt. 2 qrs. 14 lbs., gross; tare 14 lbs. per cwt.; tret as allowed?

Rule with Example.—Find the tare by the foregoing rule, and subtract it from the gross; divide the remainder, or suttle it as it is called, by 26 (26 being the fourth of 104) for the tret; this, when subtracted from the suttle, leaves the net weight required.

	cwt.	*qrs.*	*lbs.*	
	4	2	14	gross
		2	8	tare
26)	4	0	6	suttle
			17	tret
	3	3	17	net

6. What is the net weight of 9 hhds. of tobacco, each weighing 5 cwt. 2. qrs. 12 lbs.; tare 96 lbs. per hhd; tret as usual?

7. What is the net weight of 6 chests of tea, each weighing 1 cwt. 3 qrs. 9 lbs.; tare 18 lbs. per chest; tret as allowed?

8. The gross weight of 24 barrels of rice is 67 cwt. 2 qrs. 18 lbs.; tare 1 qr. 12 lbs. per barrel; tret as usual; what is the net weight?

Case IV.—*When the tare, tret, and cloff are allowed.*

What is the net weight of 4 cwt. 2 qrs. 14 lbs., gross; tare 14 lbs. per cwt.; tret as allowed; cloff as allowed?

Rule with Example.—Take the tare and the tret from the gross as before; divide the remainder or suttle by 168 (168 being the half of 3 cwt. or 336 lbs.) this being subtracted, leaves the net weight. The cloff may also be obtained by multiplying the cwt. by the tret suttle by 2, and divide by 3, receiving the quotient pounds : thus $2\times3=6\div3=2$ lbs.

	cwt.	*qrs.*	*lbs.*	
14 = $\frac{1}{8}$)	4	2	14	gross
		2	8	tare
26)	4	0	6	
			17	tret
168)	3	3	17	suttle
			2	cloff
	3	3	15	net

9. What is the net weight of 8 hhds. of sugar, each weighing 6 cwt. 3 qrs. 14 lbs.; tare 12 lbs. per cwt.; tret and cloff as usual?

10. What is the net weight of 8 hhds. of tobacco, each 3 cwt. 2 qrs., gross; tare 18 lbs. per cwt.; tret and cloff as allowed?

11. The gross weight of 50 casks of butter is 202 cwt. 2 qrs. 12 lbs.; tare 15 lbs. per cwt.; tret and cloff as allowed; what is the net weight?

12. What is the net weight of 24 hhds. weighing, gross, 47 cwt. 2 qrs. 18lbs.; tare 2 qrs. 18 lbs. per hhd.; tret as usual?

13. What is the net weight of 19 chests, each weighing 2 cwt. 13 lbs.; tare 14 lbs. per chest; tret as allowed?

14. What is the value of the net weight of 3 hhds. of tobacco, each weighing 4 cwt. 2 qrs. 12 lbs., gross, at 7*l.* 10*s.* 6*d.* per cwt., allowing 7 lbs. per cwt. for tare; tret as usual and cloff 2 lbs. per hhd.?

SIMPLE INTEREST.

INTEREST is money paid for the loan of money.

The principal is the sum of money lent.

The rate per cent is the sum to be given for the loan of £100.

The amount is the principal and interest added together. Thus, if I get from a banker £100 at 5 per cent., I must pay him back at the end of the year the principal, viz.; £100, and the interest, viz.; £5. The principal and interest, viz.; £105 that I pay, is the amount.

Case I.—*To find the Interest of any sum for one or more years.*

What is the interest of 26*l.* 10*s.* at 5 per cent. per annum, for 3 years?

Rule with Example.—Multiply the principal, 26*l.* 10*s.* by the rate, 5, and divide the product, 132*l.* 10*s.* by 100. The quotient, 1*l.* 6*s.* 6*d.* is the interest of the principal for one year; this multiplied by the number of years, 3, will give the interest for the number of years, which in this instance is 3*l.* 19*s.* 6*d.*

```
      £  s.
     26 10
         5
    ------  £  s. d.
100)132 10(1  6  6
    100          3
    ---    -------
     32     3 19  6
     20
    ---
    650
    600
    ---
     50
     12
    ---
    600
    600
    ---
```

1. What is the interest of 267*l.* for 4 years, at 5 per cent ?

2. What is the interest of 964*l.* 15*s.* for 6 years, at 4 per cent ?

3. What is the interest of 2368*l.* 10*s.* for 4½ years, at 4½ per cent ?

4. What is the interest of 768*l.* 9*s.* 6*d.* for 9½ years, at 3¼ per cent ?

5. What is the amount of 9687*l.* for 7 years, at 5 per cent ?

6. What is the amount of 379*l.* 16s. for 9½ years, at 4¾ per cent ?

7. What is the interest of 4268*l.* 17*s.* 9*d.* for 20½ years, at 2⅓ per cent ?

8. What is the amount of 3786*l.* 14s. for 17 years, at 4⅗ per cent ?

9. What is the interest of 796*l.* 18*s.* 7*d.* for 19¾ years, at 3⅜ per cent ?

10. What is the amount of 968*l.* 16*s.* 7*d.* for 10¼ years, at 4⅜ per cent. ?

Case II.—*To find the interest for weeks and days.*

What is the interest of 400*l.* for 10 weeks and 3 days, at 4 per cent. per annum?

Rule with Example.—Find, by case I. the interest of 400*l.* for one year, at 4 per cent.; it is 16*l.* Multiply the number of days in the weeks and days, 73 = 10 weeks and 3 days, by the rate per cent. or one year, 16*l.* and divide by the number of days in a year, 365; the quotient, 3*l.* 4*s.* is the percentage for 73 days.

```
days.  days.   £
 365 :  73 : : 16
         16
        ----
        438
         73
       ------
 365) 1168(3l.4s.
      1095
      ----
        73
        20
      ------
      )1460(4s.
       1460
       ----
```

Or,

If, as is the case in this example, the number of days form an aliquot part of a year; divide the interest of one year by that aliquot part, 5, because 73 days is ⅕ of a year.

```
                 £
73 = ⅕) 16
       -------
       £3 4s.
```

11. What is the interest of 426*l.* for 6 weeks and 4 days, at 5 per cent. per annum?

12. What is the interest of 764*l.* 16*s.* for 9 weeks and 3 days, at 4 per cent. per annum?

13. What is the interest of 376*l.* 14*s.* 8*d.* for 240 days, at 4½ per cent. per annum?

14. What is the amount of 748*l.* 17*s.* for 120 days, at 3⅓ per cent. per annum?

15. What is the interest of 859*l.* 13*s.* for 6 years, 8 weeks, and 4 days, at 2½ per cent. per annum?

16. What is the amount of 978*l.* for 3 years and 136 days, at 4⅕ per cent. per annum?

17. What is the interest of 7462*l.* 13*s.* for 9 years and 6 weeks, at 3½ per cent. per annum?

18. What is the amount of 846*l.* for 12 years and 93 days, per cent. per annum?

19. What is the interest of 764*l.* 7*s.* 6*d.* for 5 weeks and 6 days, at 3¼ per cent. per annum?

20. What is the amount of 9864*l.* 17s. 9*d.* for 10 years, 7 weeks, and 4 days, at 4⅜ per cent. per annum?

21. Required the interest of 460*l.* 12*s.* 6*d.* for 2 years and 4 months, at 5 per cent. per annum?

22. Required the interest of 326*l.* 15*s.* for 8 weeks and 5 days, at 4 per cent. per annum?

23. What is the amount of 864*l.* for 120 days, at 4½ per cent. per annum?

24. What is the amount of 978*l.* for 6 years and 89 days, at 3¾ per cent. per annum?

25. What is the interest of 723*l.* 15*s.* 6*d.* for 3½ years, at 4¾ per cent. per annum?

26. Required the amount of 246*l.* 15*s.* for 3 years, 6 weeks, and 4 days, at 2½ per cent. per annum?

DISCOUNT.

Discount is an allowance made for the payment of money before it is due. Thus, if a person passed me a bill for £105, to be paid at the end of a year, and I wished money immediately, I might take it to a banker, who, if he was sure of getting the money at the end of the year, would give me £100, keeping £5 to himself for the interest of the £100 he had advanced. The £5 that the banker kept is called discount; and the £100 is the *present value* of £105 a year hence, at 5 per cent.

Rule.—As £100 with the interest for the given rate and time added to it, is to the sum or debt, so is the interest of £100 for the given rate and time, to the discount.

What is the discount on 250*l.* due 6 months hence, at 5 per cent?

Example.—Here 2*l.* 10*s.* is added to 100*l.* for the first term, because 2*l.* 10*s.* is the interest of 100*l.* for 6 months, at 5 per cent. The second term is the debt, viz.: 250*l.* The third term is the interest on 100*l.* for 6 months, at 5 per cent. The answer is 6*l.* 1*s.* 11¼d.; subtract this from 250*l.* and the present value of 250*l.* is obtained, viz.: 243*l.* 18*s.* 0¾*d.*

```
 l.    s.
100
  2   10     l.     l.  s.
---------
102   10 : 250 : : 2 : 10
 20           50   20
----        -----  --
2050      )12500   50
          ------------
           6l. 1s. 11¼d.
```

1. What is the present value of 640*l.* due 2 years hence, at 5 per cent?

2. What is the discount on 736*l.* due 9 months hence, at 5 per cent?

3. What is the discount on 370*l.* due 100 days hence, at 4½ per cent?

4. What is the discount on 246*l.* 16*s.* from March 26, to June 23, both days included, at 3¾ per cent?

COMMISSION, BROKERAGE, INSURANCE, BUYING AND SELLING STOCKS.

Commission is an allowance given to an agent or factor, for buying or selling goods, negotiating bills, &c.

Brokerage is an allowance to a broker for procuring sales, transfers of property, &c.

Insurance is an allowance, called premium, given to persons who engage to make good the loss of ships, merchandise, houses, &c., that may be lost or damaged by storms, fire, &c.

Stock is the debt owing by government, or it is the capital of any trading company.

Any questions in these rules may be performed by the rules for Simple Interest.

EXAMPLES.

What is the commission on 426*l.* 16*s.* at 2½ per cent?

$$\begin{array}{rrr} & l. & s. \\ & 426 & 16 \\ & & 2\frac{1}{2} \\ \hline & 853 & 12 \\ \frac{1}{2} = & 213 & 8 \\ \hline 100) & 1067 & 0 \\ \hline & \pounds 10 & 13s.\ 4\frac{3}{4}d. \end{array}$$

What is the insurance on 426*l.* 16*s.* at 12½ per cent?

$$\begin{array}{rrr} & l. & s. \\ & 426 & 16 \\ & & 12\frac{1}{2} \\ \hline & 5121 & 12 \\ \frac{1}{2} = & 213 & 8 \\ \hline 100) & 5335 & 0 \\ \hline & \pounds 53 & 7s. \end{array}$$

or thus;

$$\begin{array}{rrrr} & l. & s. & d. \\ 10 = \frac{1}{10}) & 426 & 16 & 0 \\ \hline & 42 & 13 & 7 \\ 2 = \frac{1}{5}\ \Big\} & 8 & 10 & 8\frac{1}{2} \\ \frac{1}{2} = \frac{1}{4}\ \Big\} & 2 & 2 & 8 \\ \hline & \pounds 53 & 6s. & 11\frac{1}{2}d. \end{array}$$

What is the brokerage on 426*l.* 16*s.* at 5*s.* or ¼ per cent?

$$\begin{array}{rrr} & l. & s. \\ \frac{1}{4}) & 426 & 16 \\ \hline 100) & 106 & 14 \\ \hline & \pounds 1 & 1s.\ 4\frac{1}{4}d. \end{array}$$

What is the purchase of 426*l.* bank stock, at 110¼ per cent?

$$\begin{array}{rrr} & l. & \\ & 426 & \\ & 110\frac{1}{4} & \\ \hline & 46860 & \\ \frac{1}{4} = & 106 & 10 \\ \hline 100) & 46966 & 10 \\ \hline & \pounds 469 & 13s.\ 3\frac{1}{2}d. \end{array}$$

or thus;

$$\begin{array}{rrrr} & l. & s. & d. \\ 10 = \frac{1}{10}) & 426 & & \\ \frac{1}{4} = \frac{1}{40}) & 42 & 12 & \\ & 1 & 1 & 3\frac{1}{2} \\ \hline & \pounds 469 & 13s. & 3\frac{1}{2}d. \end{array}$$

EXERCISES.

1. What is the commission on 496*l.* 16*s.* 6*d.* at 2½ per cent?

2. What is the commission on 1243*l.* 19*s.* at ½ per cent?

3. What is the brokerage on 3964*l.* 14*s.* at 1½ per cent?

4. What is the brokerage on 467*l.* at ⅜ per cent?

5. I employed an agent to sell a quantity of goods; having agreed to give him ⅜ per cent. upon the sales, the goods having sold for 7648*l.*; how much am I to pay him?

6. An agent charges 4½ per cent. for commission and risk of bad debts; his sales in the year are 16,780*l.* and his losses 347*l.* what is his income?

7. A salesman disposes of woollen goods to the amount of 1467*l.*, muslins to 1342*l.*, and hardware to 964*l.*, what is his commission at 2⅛ per cent?

8. What premium must be paid for insuring a house for 7684*l.* at 2¼ per cent?

9.* What is the premium on 4968*l.* at 5½ guineas per cent

10. What is the insurance on 6968*l.* for 2 years, at 4¼ per cent?

11. What is the premium on 7848*l.* at 6 guineas per cent?

12. What is the insurance on 796*l.* for 3 years and 42 days, at 3½ per cent?

13. What is the value of 796*l.* stock, at 105 per cent?

14. What is the purchase of 978*l.* India stock, at 74¼ per cent?

15. What is the price of 7468*l.* bank stock, at 168 per cent?

16. What is the brokerage on 429*l.* 16*s.* 6*d.* at 2½ per cent?

---

* If the rate be in *guineas*, calculate as if it were *pounds*, and add one-twentieth to the amount.

17. Required the commission on 648*l.* at 2¼ per cent?

18. What is the premium of insurance on 968*l.* at 4*l.* 12*s.* 6*d.* per cent?

19 What is the expense of insuring a ship and cargo, at 3*l.* 15*s.* per cent.; the ship being worth 2450*l.* and the cargo worth 4768*l.*?

20. At 4½ per cent., how much must be insured on goods worth 768*l.* so that in case of loss the owner may receive the value of the goods and the premium?

21. I allow my broker 3¾ per cent.; how much do I owe him for selling goods to the amount of 796*l.*?

22. What is the purchase of 3450*l.* India stock, at 112¼ per cent?

23. What is the purchase of 268*l.* 16*s.* 6*d.* bank stock, at 76½ per cent?

COMPOUND INTEREST.

COMPOUND INTEREST is interest, not only for the use of the sum borrowed, but also for the use of the interest, if it be not paid at the end of a year. Thus, if I borrow £100 at 5 per cent, I owe at the end of the year £105. If I wish to pay off the debt, I pay £105. If I wish merely to pay the interest, I pay £5, and still owe £100. If, however, I do neither, it is obvious that at the end of the second year I must pay interest, not upon £100, but upon £105.

What is the compound interest of 240*l.* 10*s.* for 3 years, at 5 per cent?

	£	*s.*	*d.*	
5 = $\frac{1}{20}$)	240	10	0	1st year's principal.
add	12	0	6	1st year's interest.
$\frac{1}{20}$)	252	10	6	2nd year's principal.
add	12	12	6¼	2nd year's interest.
$\frac{1}{20}$)	265	3	0¼	3rd year's principal.
add	13	5	1¾	3rd year's interest.
	278	8	2	amount in 3 years.
subtract	240	10	0	principal.
	£37	18	2	compound interest for 3 years.

Rule with Example.—Find the interest upon the principal for 1 year at 5 per cent, viz. 12*l.* 0*s.* 6*d.* and add it to the principal. At the beginning of the second year the principal is 252*l.* 10*s.* 6*d.* find the interest upon this for 1 year, at 5 per cent., add it; and so on for any number of years.—278*l.* 8*s.* 2*d.* is what 240*l.* 10*s.* *amounts* to in 3 years. The compound interest is found by taking the original principal, 240*l.* 10*s.* from the amount in 3 years, 278*l.* 8*s.* 2*d.*, and what remains, 37*l.* 18*s.* 2*d.* is the compound interest on 240*l.* 10*s.* for 3 years.

1. Required the interest on 420*l.* for 3 years, at 5 per cent?

2. Required the amount of 640*l* for 4 years, at 3 per cent?

3. What will 436*l.* amount to in 3 years, at 4½ per cent?

4. What is the compound interest on 678*l.* 16*s.* for 6 years, at 3½ per cent. per annum?

5. What will 764*l.* amount to in 4 years at 6 per cent?

6. What is the compound interest on 786*l.* 10*s.* for 6 years at 4½ per cent per annum?

BARTER.

When one person gives goods to another and receives, not money, but goods in return, he is said to Barter.

How many yards of cloth, at 10*s.* per yard, ought I to get for 98 lbs. of tea, at 8*s.* per pound?

Rule with Example.—Find the value of the goods given. In this example the value of the tea is found to be 784*s.*; you have therefore to consider how many yards of cloth you ought to receive for 784*s.* the value of 1 yard being 10*s.*

lbs.
98
8
10)784
$78\frac{4}{10}$

All the questions in this rule may be found either by Simple Proportion or Practice.

1. How many pairs of shoes, at 12s. per pair, must be given for 206 pairs of stockings at 2s. per pair?

2. How much tea, at 7s. per lb., ought I to receive for 1 cwt. of coffee at 2s. per lb.?

3. How much brandy, at 23s. per gallon, ought I to receive for 98 gallons of rum at 15*s.* per gallon?

4. A chandler gave 2 cwt. 3 qrs. of tallow at 1*l.* 18*s.* 6*d.* per cwt.; how much soap ought he to receive at 5*d.* per lb.

5. How much iron at $1\frac{1}{2}$*d.* per lb. ought a nailer to receive for 9860 nails, at $6\frac{1}{2}$*d.* per hundred?

PROFIT AND LOSS.

The use of this rule is to discover how much is gained or lost in buying and selling goods.

Case I.—*When the prime cost and selling price are given to find the entire gain or loss on any quantity of goods.*

Bought 12 yards of cloth at 9*s.* 8*d.* per yard, and sold it at 11*s.* 6*d.*; what did I gain on the whole?

Rule with Example.—Subtract the cost price, 9*s.* 8*d.*, from the selling price, 11*s.* 6*d.*, and multiply the gain upon one yard, 1*s.* 10*d.*, by the number of yards bought, 12. The product, 1*l.* 2*s.* is the gain on the 12 yards.

	s.	*d.*
	11	6
	9	8
	1	10
		12
£1	2	0

1. Bought 256 yards of cloth at 12*s*. 9*d*. per yard, and sold it at 14*s*. 9*d*.; what did I gain?

2. Bought 406 lbs. of butter at 10*d*. per lb., and sold it at 14*d*. per lb.; what was gained on the whole?

3. Bought 248 pairs of stockings at 1*s*. 8*d*. per pair, and sold the whole for 12*l*. 16*s*.; what was the gain or loss?

4. Bought 9 cwt. of cheese at 2*l*. 12*s*. per cwt., and sold it at 2*l*. 18*s*. per cwt.; what was the gain upon the whole?

5. Sold a chest of tea containing 144 lbs., for 57*l*. 10*s*. how much did I gain, the tea having cost me 6*s*. 8*d*. per lb.?

Case II.—*The first cost and selling price being given, to find the gain per cent.*

Bought cloth at 12*s*. per yard, and sold it at 14*s*. per yard; what was the gain per cent.?

Rule with Example.—Find the gain or loss by the former case; then say, as the cost price, 12*s*., is to the gain, 2*s*., so is 100*l*. to the gain or loss per cent.

```
              s.
              14
              12
         s.   —        l.
         12 : 2  : :  100
                       20
                     ————
                     2000
                        2
                   ——————
                  12)4000
                 2,0)33,3  4
                 £16 13    4
```

6. If a pound of tea be bought for 6*s*. 6*d*., and sold for 7*s*. 4*d*., what is the gain per cent.?

7. When wine is bought for 18*s*. 6*d*. per gallon, and sold for 27*s*. 8*d*. per gallon; what is the gain per cent?

8. Bought a quantity of goods for 64*l*., and sold them for 76*l*.; what was the gain per cent?

9. Bought cloth at 6*s*. 8*d*. per yard; but finding it not so good as I expected, I was obliged to sell it at 6*s*. 4*d*.; how much did I lose per cent?

PARTNERSHIP.

Partnership is when two or more persons unite in trade, and agree to share the profits or losses, according to the terms of agreement.

Case I.—*Partnership without time.*

Rule.—As the whole capital is to the whole gain or loss, so is each partner's stock to his share of the gain or loss.

Example.—A, B, and C entered into partnership: A gave 400*l.*, B 500*l.*, and C 700*l.*; they gained 350*l.*; what is each partner's share of the gain?

Capitals.
A 400
B 500
C 700
£1600

1600*l.* : 350*l.* :: 400*l.* : 87*l.* 10*s.* 0*d.* A's gain.
400
16,00)1400,00
£87 10

1600*l.* : 350*l.* :: 500*l.* : 109*l.* 7*s.* 6*d.* B's gain.
500
16,00)1750,00
£109 7 6

1600*l.* : 350*l.* :: 700*l.* : 153*l.* 2*s.* 6*d.* C's gain.
700
16,00)2450,00
£153 2 6

1. Two persons, A and B, entered into partnership; A put into the business 865*l.*, B 2608*l.*; they gain 964*l.*; what was each person's share of the profit?

2. Three merchants freight a ship to America: the value of the cargo was 2640*l.*; of this 686*l.* belonged to A; 1200*l.* to B; and the rest to C; they lose upon the whole cargo 524*l.*; what is each merchant's share of the loss?

3. Three wine merchants freighted a ship with 468 pipes of wine, of which 142 pipes belonged to A; 204 to B; and the rest to C. During a storm the sailors were obliged to throw overboard 96 pipes; what was the loss sustained by each?

4. Three persons pay a tax of 100*l.*, in proportion to the annual value of their property. A's property is worth 800*l.* per annum; B's 600*l.*; and C's 400*l.*; how much is each to pay?

Case II.—*Partnership with time.*

Rule.—Multiply each person's money by the time it continued in the business, and proceed as in Case I.

Example.—Three persons enter into partnership: A puts in 200*l.* for 4 months; B 400*l.* for 6 months; and C 800*l.* for 7 months. They gain 500*l.*; what is each person's share of the gain?

Capital

A 200×4= 800   8800*l.* : 500*l.* : : 800*l.* : 45*l.* 9*s.* 1*d.* A's gain

B 400×6=2400   800

C 800×7=5600   88,00)4000,00

8800   £45 9 1

8800*l.* : 500*l.* : : 2400*l.* : 136*l.* 7*s.* 3¼*d.* B's gain

2400

88,00)12000,00

£136 7 3¼

8800*l.* : 500*l.* : : 5600*l.* : 318*l.* 3*s.* 7½*d.* C's gain

5600

88,00)28000,00

£318 3 7½

5. A, B, and C enter into business; A puts in 968*l.*; B 1420*l.*, and C 2470*l.* A's money was in the business 2 years, B's 5 years, and C's 7 years: they gained 2348*l.*; how ought the gain to be divided among them?

6. Three graziers rented a piece of land for 98*l.*; A put 8 cows on the land for 4 months; B 5 cows for 7 months, and C 9 cows for 6 months; how much ought each to pay of the rent?

7. A, B, C, and D, put each into partnership 750*l.*; A's money remains 7 months; B's 9 months, C's 11 months, and D's a year; they gain 438*l.*; what is each person's share of ?

VULGAR FRACTIONS.

A FRACTION is a part of anything, and is represented by two numbers, one above the line and the other below it: thus, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$,—read one-half, two-thirds, three-fourths.

The figure above the line is called the *numerator*; the figure below the line is called the *denominator*; thus, in the fraction $\frac{4}{5}$, read four-fifths; the 4 is the numerator and the 5 is the denominator.

The denominator marks the number of equal parts into which the whole is divided; the numerator shows the number of those intended to be expressed by the fraction: thus, if I say that I have $\frac{2}{3}$ of an apple, I mean that the apple was divided into three equal parts, and that I have two of these parts.

A PROPER FRACTION is that which has its numerator *less* than its denominator, as $\frac{1}{2}$, $\frac{2}{3}$, $\frac{4}{7}$.

AN IMPROPER FRACTION is that which has its numerator *greater* than its denominator, as $\frac{3}{2}$, $\frac{7}{4}$, $\frac{8}{3}$.

A COMPOUND FRACTION is a fraction of a fraction, and is expressed by two or more fractions, as $\frac{2}{3}$ of $\frac{3}{4}$, or $\frac{1}{3}$ of $\frac{2}{3}$ of $\frac{4}{9}$.

A MIXED NUMBER is a whole number with a fraction annexed, as $2\frac{1}{2}$, $4\frac{2}{3}$, $16\frac{4}{5}$.

Any whole number may be made a fraction of by writing a 1 under it for a denominator: for example, 6 may be made a fraction of by writing it thus $\frac{6}{1}$, or 10 thus $\frac{10}{1}$. The value of a fraction is not altered by multiplying or dividing both the numerator and denominator, provided both be multiplied or divided by the same number.

REDUCTION.

Case I.—*To change an improper fraction into a whole or mixed number.*

Rule.—Divide the numerator by the denominator, and if there be any remainder write the denominator under it in the form of a fraction.

Example.—Reduce the improper fraction, $\frac{1367}{5}$, to a whole or mixed number.

$$5\overline{)1367}$$
$$273\tfrac{2}{5}\ \textit{Ans.}$$

1. Reduce $\frac{7463}{3}$ to its equivalent whole or mixed number.
2. Reduce $\frac{8463}{14}$ to its equivalent whole or mixed number.
3. Reduce $\frac{9786}{43}$ to its equivalent whole or mixed number.
4. Find the value of $\frac{64237}{698}$ in whole or mixed numbers.
5. Find the value of $\frac{8363}{89}$ in whole or mixed numbers.

Reduce the following fractions to whole or mixed numbers :

6. $\frac{8586}{43}$
7. $\frac{7982}{680}$
8. $\frac{3643}{2104}$
9. $\frac{742683}{7687}$
10. $\frac{968760}{2760}$
11. $\frac{492001}{487600}$
12. $\frac{736201}{7036}$
13. $\frac{480010}{3684}$
14. $\frac{876246}{4968}$

Case II.—*To reduce a mixed number to an improper fraction.*

Rule.—Multiply the whole number by the denominator of the fraction; add the numerator, and under the product place the denominator.

Example.—Reduce the mixed number $46\frac{3}{5}$ to an improper fraction.

$$46\tfrac{3}{5}$$
$$5$$
$$230+3=\tfrac{233}{5}$$

Reduce the following mixed numbers to their equivalent improper fractions :

15. $7\frac{1}{2}$
16. $8\frac{3}{5}$
17. $17\frac{4}{5}$
18. $9\frac{1}{5}$
19. $27\frac{4}{7}$
20. $647\frac{2}{15}$
21. $360\frac{10}{17}$
22. $976\frac{21}{30}$
23. $842\frac{17}{36}$
24. $684\frac{19}{47}$
25. $976\frac{24}{126}$
26. $843\frac{31}{421}$
27. $687\frac{28}{111}$
28. $769\frac{111}{234}$
29. $807\frac{101}{681}$

Case III.—*To reduce a compound fraction to a simple fraction.*

Rule.—Multiply together all the numerators for a numerator, and all the denominators for a denominator.

Example.—Reduce the compound fraction $\frac{2}{3}$ of $\frac{6}{7}$ of 5 to a simple fraction.

$$\frac{2}{3}\times\frac{6}{7}\times\frac{5}{1}=\frac{60}{21}\ \textit{Ans.}$$

Reduce the following compound fractions to their equivalent simple ones :—

30. $\frac{3}{5}$ of $\frac{2}{7}$ of $\frac{5}{7}$
31. $\frac{7}{9}$ ... $\frac{3}{11}$ ... $\frac{8}{15}$
32. $\frac{6}{13}$ ... $\frac{17}{3}$ ... $\frac{11}{29}$
33. $\frac{4}{5}$ ... $\frac{8}{11}$ ... $\frac{11}{12}$
34. $\frac{7}{17}$ ... $\frac{8}{19}$ ... 7
35. $\frac{17}{25}$ of $\frac{8}{9}$ of $\frac{3}{25}$ of $\frac{13}{19}$
36. $\frac{12}{37}$ ... $\frac{1}{7}$ ... $\frac{18}{33}$ ... $19\frac{1}{8}$
37. $\frac{11}{21}$ ... $\frac{17}{36}$ ... $\frac{135}{78}$ ... 24
38. $\frac{3}{7}$ ... $\frac{9}{17}$ ... $\frac{28}{78}$ ... 32
39. $\frac{7}{15}$ ... $\frac{13}{19}$ ... $\frac{21}{35}$ ... $27\frac{2}{3}$

Case IV.—*To reduce a fraction to its lowest terms.*

Rule.—Divide the numerator and denominator by any number that will measure them; that is, that will divide them without a remainder. Do the same with the quotients as long as any number can be found to divide them.

Reduce $\frac{144}{240}$ to its lowest terms.

Divide the fractions and the quotients by the figures placed above them.

$$\overset{(2)}{\frac{144}{240}}=\overset{(2)}{\frac{72}{120}}=\overset{(3)}{\frac{36}{60}}=\overset{(2)}{\frac{12}{20}}=\overset{(2)}{\frac{6}{10}}=\frac{3}{5}\ \textit{Ans.}$$

Or,

If a number be wished for that may bring the fraction to its lowest terms at once, divide the greater term by the less, and the divisor by the remainder; and so on, dividing each divisor by the last remainder till nothing remains. The last *divisor* is the number by which, if the numerator and denominator of the fraction be divided, the lowest term will be obtained.

Reduce $\frac{144}{240}$ to its lowest terms.

The denominator of the fraction being greater, it is divided by the numerator. The former divisor, 144, is now to be divided by the remainder, 96; the remainder, 48, is now to divide the former divisor, 96. The last divisor, 48, is the number by which, if the numerator and denominator be divided, the lowest term will be obtained: thus, $48)\frac{144}{240}=\frac{3}{5}$, as in former example.

144)240(1
144
96) 144(1
96
48) 96(2
96
—

Reduce the following numbers to the lowest terms:

40. $\frac{48}{272}$
41. $\frac{45}{116}$
42. $\frac{176}{484}$
43. $\frac{48}{160}$
44. $\frac{740}{8675}$
45. $\frac{764}{5240}$
46. $\frac{644}{1728}$
47. $\frac{825}{1920}$
48. $\frac{55}{9900}$
49. $\frac{1245}{220}$
50. $\frac{1344}{1536}$
51. $\frac{1408}{1664}$

Case V.—*To reduce fractions to a common denominator.*

Rule.—Multiply each numerator by all the denominators, *except its own*, for a new numerator; and multiply all the denominators together for a new denominator.

Reduce $\frac{2}{3}$, $\frac{3}{5}$, and $\frac{4}{7}$ to a common denominator.

Here the first numerator, 2, is multiplied by 5 and 7 the denominators of the other fractions. Mark that it is not multiplied by its own denominator, 3. The same is done to the other numerators. The answer then is $\frac{70}{105}$, $\frac{63}{105}$, $\frac{60}{105}$.

$$\left.\begin{array}{l} 2\times5\times7=70 \\ 3\times3\times7=63 \\ 4\times3\times5=\underline{60} \end{array}\right\} \text{numerators}$$
$$\overline{3\times5\times7}=\overline{105}\text{com. denom.}$$

Reduce the following fractions to others having a common denominator.

52. $\frac{3}{4}$, $\frac{2}{3}$, and $\frac{4}{7}$.
53. $\frac{5}{6}$, $\frac{7}{8}$, and $\frac{8}{9}$.
54. $\frac{9}{11}$, $\frac{7}{18}$, and $\frac{13}{15}$.
55. $\frac{13}{16}$, $\frac{11}{39}$, and $\frac{18}{27}$.
56. $\frac{17}{24}$, $\frac{18}{26}$, $\frac{15}{42}$, and $\frac{13}{17}$.
57. $\frac{21}{47}$, $\frac{18}{39}$, $\frac{41}{59}$, and $\frac{87}{78}$.
58. $\frac{71}{81}$, $\frac{39}{281}$, $\frac{410}{701}$, and $\frac{7}{81}$
59. $\frac{518}{401}$, $\frac{710}{5028}$, $\frac{788}{980}$ and $\frac{8}{72}$

ADDITION.

Rule.—Reduce compound fractions to simple fractions, and mixed numbers to improper fractions. Having done this, bring them to a common denominator. Add all the numerators together, and place, under the result, the common denominator. If the answer be an improper fraction, bring it to a mixed number.

Add together the following fractions, $\frac{2}{3}$, $\frac{3}{5}$, and $4\frac{1}{2}$

Here the mixed number $4\frac{1}{2}$ is first brought to the improper fraction $\frac{9}{2}$, and then all the fractions are brought to a common denominator.

$$\left.\begin{array}{r} 2\times5\times2=20 \\ 3\times3\times2=18 \\ 9\times3\times5=135 \end{array}\right\}\text{numerators}$$

$$\overline{3\times5\times2=30}\ \text{com. denom.}$$

Therefore $\frac{20}{30}+\frac{18}{30}+\frac{135}{30}=\frac{173}{30}=5\frac{23}{30}$ sum required.

Add together the following fractions and mixed numbers.

1. $\frac{2}{3}+\frac{3}{5}+\frac{4}{9}$
2. $\frac{3}{7}+\frac{8}{11}+\frac{12}{13}$
3. $\frac{4}{7}+\frac{11}{16}+\frac{18}{23}$
4. $\frac{7}{9}+\frac{13}{17}+\frac{14}{19}+\frac{28}{121}$
5. $\frac{8}{13}+\frac{11}{23}+\frac{9}{17}+\frac{14}{39}$
6. $\frac{21}{42}+\frac{41}{53}+\frac{71}{89}+\frac{22}{23}$
7. $\frac{2}{5}$ of $\frac{6}{7}+\frac{2}{13}+\frac{2}{3}$ of $\frac{7}{8}$
8. $\frac{4}{7}+\frac{9}{13}$ of $\frac{12}{19}+\frac{4}{5}$ of $5\frac{1}{2}$
9. $\frac{13}{18}$ of $7\frac{2}{3}$ of $9+\frac{2}{7}$ of 14
10. $\frac{21}{23}+\frac{11}{15}$ of $2\frac{2}{3}+\frac{2}{9}$ of $6\frac{2}{3}$
11. $\frac{17}{19}$ of $\frac{23}{49}$ of $17\frac{4}{5}+\frac{4}{7}$ of 12
12. $\frac{13}{27}+\frac{19}{23}$ of $9\frac{2}{3}+\frac{11}{35}$ of $8\frac{4}{7}$

SUBTRACTION.

Rule.—Reduce the fractions to common denominators, as in addition. Find the difference of the numerators, under which write the common denominator.

From $\frac{12}{15}$ take $\frac{4}{7}$.

Here the fractions are first brought to a common denominator; then the 60 taken from 84, and the common denominator written under the difference

$$\left.\begin{array}{r} 12\times7=84 \\ 4\times15=60 \end{array}\right\}\text{numerators}$$

$$\overline{15\times7=105}\ \text{com. denom.}$$

Therefore $\frac{84}{105}-\frac{60}{105}=\frac{24}{105}$ the answer.

What is the difference between the following fractions?

1. $\frac{4}{7} - \frac{3}{4}$
2. $\frac{6}{11} - \frac{8}{9}$
3. $\frac{7}{15} - \frac{4}{13}$
4. $\frac{9}{13} - \frac{6}{19}$
5. $4\frac{1}{2} - \frac{9}{16}$
6. $\frac{27}{8} - 5\frac{4}{7}$
7. $2\frac{1}{8} - 3\frac{2}{5}$
8. $6\frac{4}{7} - 9\frac{1}{10}$
9. $\frac{9}{11} - \frac{1}{13}$ of 4
10. $\frac{11}{54} - \frac{3}{26}$ of $\frac{5}{6}$
11. $169 - 14\frac{3}{7}$
12. $76\frac{1}{4} - \frac{2}{3}$ of 19.

MULTIPLICATION.

Rule.—Reduce the mixed numbers to improper fractions, and compound fractions to simple ones; after this has been done, multiply all the numerators together for the numerator of the product, and all the denominators together for its denominator.

Multiply $6\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{7}{8}$.

$$6\tfrac{2}{3} = \tfrac{20}{3} \text{ and } \tfrac{2}{3} \text{ of } \tfrac{7}{8} = \tfrac{14}{24}$$
$$\text{then } \tfrac{20}{3} \times \tfrac{14}{24} = \tfrac{280}{72} = 3\tfrac{64}{72} \textit{ Ans.}$$

Here the mixed number $6\frac{2}{3}$ is converted into the improper fraction $\frac{20}{3}$, and the compound fraction $\frac{2}{3}$ of $\frac{7}{8}$ into the simple fraction $\frac{14}{24}$. The numerators and denominators being multiplied, produce the improper fraction $\frac{280}{72}$, which being reduced to a mixed number gives $3\frac{64}{72}$ the answer.

Multiply together the following fractions.

1. $\frac{3}{4} \times \frac{5}{8}$
2. $\frac{7}{9} \times \frac{8}{11}$
3. $\frac{9}{11} \times \frac{11}{12}$
4. $\frac{4}{15} \times \frac{4}{17}$
5. $8\frac{3}{4} \times \frac{5}{12}$
6. $7 \times \frac{5}{13}$
7. $5\frac{3}{8} \times 11\frac{1}{4}$
8. $3\frac{5}{8} \times 4\frac{5}{6}$
9. $8\frac{2}{5} \times \frac{2}{3}$ of $\frac{7}{8}$
10. $16 \times \frac{4}{7}$ of $\frac{8}{15}$
11. $17\frac{2}{5} \times \frac{17}{19}$ of $7\frac{4}{5}$
12. $24\frac{7}{13} \times \frac{13}{16}$ of $9\frac{1}{5}$

DIVISION.

Rule.—Prepare the fractions as in multiplication; then invert the divisor and proceed as in multiplication.

Divide $\frac{4}{7}$ by $\frac{3}{5}$ $\frac{4}{7}\div\frac{3}{5}$ inverted thus $\frac{4}{7}\times\frac{5}{3}=\frac{20}{21}$

1. Divide $\frac{14}{5}$ by $\frac{11}{12}$
2. $\frac{21}{80}$ $\frac{3}{10}$
3. $\frac{15}{16}$ $\frac{4}{5}$
4. $\frac{33}{35}$ $\frac{3}{8}$
5. $\frac{13}{37}$ $\frac{18}{43}$
6. $\frac{16}{351}$ $\frac{4}{27}$
7. Divide $5\frac{6}{7}$ by $\frac{6}{7}$
8. $3\frac{31}{48}$ $\frac{5}{12}$
9. $3\frac{1}{6}$ $9\frac{1}{2}$
10. $9\frac{1}{6}$ $\frac{1}{2}$ of 7
11. $116\frac{4}{15}$ $\frac{1}{3}$ of $5\frac{1}{3}$
12. $\frac{2}{3}$ of $\frac{3}{4}$ by $\frac{1}{2}$ of $\frac{2}{3}$

REDUCTION, Continued.

Case VI.—*To reduce fractions from one denomination to another.*

Rule.—If from a lower name to a higher, multiply the *denominator*, as in reduction of whole numbers. If from a higher name to a lower, multiply the *numerator* as in reduction of whole numbers.

Reduce $\frac{2}{3}$ of a farthing to the fraction of a pound.

Here the denominator is multiplied, as it is to be brought to a higher name. $\frac{2}{3\times4\times12\times20}=\frac{2}{2880}$

Reduce $\frac{3}{5}$ of a pound to the fraction of a penny.

Here the numerator is multiplied, as it is to be brought to a lower name. $\frac{3\times20\times12}{5}=\frac{720}{5}$

1. Reduce $\frac{3}{7}$ of a farthing to the fraction of a pound.
2. Reduce $\frac{4}{7}$ of a pound to the fraction of a penny.
3. Reduce $\frac{4}{5}$ of a shilling to the fraction of a guinea.
4. Reduce $\frac{4}{7}$ of a shilling to the fraction of a farthing.
5. Reduce $\frac{7}{9}$ of a farthing to the fraction of a crown.
6. Reduce $\frac{3}{10}$ of a day to the fraction of a week.
7. Reduce $\frac{7}{9}$ of a week to the fraction of an hour.
8. Reduce $\frac{4}{5}$ of a nail to the fraction of a yard.
9. Reduce $\frac{7}{8}$ of a cwt. to the fraction of a dram.
10. Reduce $\frac{4}{5}$ of a yard to the fraction of a mile.

Case VII.—*To express any given quantity as a fraction of another quantity, considered as an integer.*

Rule.—Reduce both quantities to one denomination; then make the reduced integer the denominator, and the other quantity the numerator.

What part of 1*l.* is 13*s.* 4*d.*?

Here both quantities, the 1*l.* and the 13*s.* 4*d.*, are reduced to pence; the pence in the integer, 240, is made the denominator, and the pence in the other quantity is made the numerator; the fraction, $\frac{160}{240}$ of a pound, is, when brought to its lowest terms, equal to $\frac{2}{3}$ of a pound.

$$\begin{array}{rrr} l. & s. & d. \\ 1 & & \\ 20 & 13 & 4 \\ \overline{20} & 12 & \\ 12 & \overline{160} & \\ \overline{240} & & \end{array}$$

then $\frac{160}{240}=\frac{2}{3}$ *Ans.*

11. Reduce 14*s.* 6*d.* to the fraction of a pound.
12. Reduce 17*s.* 4*d.* to the fraction of a pound.
13. Reduce 5*s.* 8¼*d.* to the fraction of a pound.
14. Reduce 17*s.* 9*d.* to the fraction of a penny.
15. Reduce 6*s.* 7¾*d.* to the fraction of a farthing.
16. Reduce 7 hours 21 minutes to the fraction of a day.

17. Reduce 7 lbs. 3 drams to the fraction of a cwt.
18. Reduce 8 cwt. 2 qrs. 14 lbs. to the fraction of an ounce.
19. Reduce 3 lbs. 9 oz. to the fraction of a dwt.
20. Reduce 16 hours 13 minutes to the fraction of a day.

Case VIII.—*To find the value of a fraction.*

Rule.—Reduce the numerator to the next inferior name, and divide by the denominator; reduce the remainder, if any, to the next lower name, and divide again, and so on to the lowest name.

What is the value of $\frac{7}{8}$ of a pound sterling?

Here the numerator, 7, is multiplied by 20, to bring it to the next inferior name, 140*s*. The 140*s*. are divided by 8, which gives 17*s*. and 4 of a remainder; the 4 is multiplied by 12, to bring it to the next inferior name, 48*d*.; it is then divided by 8, which gives 6 without any remainder. The answer then is 17*s*. 6*d*. which is the $\frac{7}{8}$ of a pound.

```
      7
     20
  8)140
     17  4
        12
     8) 48
         6
```

21. What is the value of $\frac{5}{7}$ of a pound?
22. What is the value of $\frac{5}{6}$ of a shilling?
23. What is the value of $\frac{4}{5}$ of a crown?
24. What is the value of $\frac{9}{11}$ of a day?
25. What is the value of $\frac{14}{23}$ of a guinea?
26. What is the value of $\frac{4}{9}$ of a yard, long measure?
27. What is the value of $\frac{13}{16}$ of a lb. troy?
28. What is the value of $\frac{13}{16}$ of a lb. avoirdupois?
29. What is the value of $\frac{23}{27}$ of a cwt.?
30 What is the value of $\frac{17}{24}$ of a mile?

PROMISCUOUS EXERCISES.

If the fractions be of different denominations it will be necessary to bring them to the same name before they are added or subtracted.

1. To $\frac{3}{7}$ of a pound add $\frac{4}{5}$ of a shilling.
2. To $\frac{4}{7}$ of a crown add $\frac{3}{8}$ of a shilling and $\frac{3}{5}$ of a penny.
3. From $\frac{5}{9}$ of a pound take $\frac{5}{9}$ of a shilling.
4. From $\frac{4}{11}$ of a shilling taken $\frac{3}{5}$ of $\frac{2}{3}$ of a penny.
5. What is the value of $\frac{5}{8}$ yard of cloth at $\frac{15}{16}$*l.* per yard?
6. What is the value of $\frac{5}{7}$ oz. of silver at $3\frac{4}{7}$*l.* per lb.?
7. If $8\frac{5}{7}$ yards of cloth cost $49\frac{3}{5}$*s.*, what is the price per yard
8. What is the price per yard, when 3 pieces of cloth, each $12\frac{3}{7}$ yards, cost $46\frac{5}{9}$*l.*?
9. What is the difference between $\frac{3}{5}$ of a league and $\frac{5}{8}$ of a mile?
10. What is the sum of $\frac{4}{5}$ of a cwt., $7\frac{4}{5}$ lbs., and $4\frac{3}{8}$ oz.?
11. From $\frac{7}{8}$ of a guinea take $\frac{3}{4}$ of a pound.
12. What is the sum of $\frac{2}{3}$ of a guinea, $\frac{3}{7}$*l.*, and $\frac{5}{8}$ of a crown?
13. How much is 8 times $\frac{13}{16}$ of a yard?
14. How much is $\frac{3}{16}$ of $\frac{5}{3}$ of a pound sterling?
15. A yard of ribbon cost 17*d.*, what is the price of $\frac{1}{2}$ of $\frac{3}{4}$ of a yard?
16. If $\frac{3}{7}$ of a yard cost $\frac{4}{15}$*l.*; what ought to be paid for $6\frac{2}{3}$ yards?
17. If $2\frac{1}{2}$ yards of flannel cost $3\frac{1}{3}$*s.*; what is the price of $4\frac{3}{4}$ yards?
18. If $\frac{3}{16}$ of a ship cost $273\frac{1}{8}$*l.*; what is $\frac{5}{32}$ of her worth?
19. If $\frac{5}{8}$ of a cwt. cost $4\frac{7}{8}$*l.* what will $4\frac{1}{2}$ lbs. cost?
20. If 1 lb. of coffee cost $2\frac{3}{4}$*s.*; how many pounds can I have for $38\frac{1}{2}$*s.*
21. If $7\frac{5}{8}$ yards cost 7*l.* 18*s.* 4*d.*; how much did $49\frac{3}{11}$ yards come to?

DECIMAL FRACTIONS.

A **Decimal Fraction** is a fraction whose denominator is 10, 100, 1000, &c., or a unit with as many cyphers annexed to it as there are figures in the numerator. Thus $\frac{5}{10}$, $\frac{25}{100}$, $\frac{325}{1000}$, are decimal fractions, and are usually written in this manner: ·5, ·25, ·325, the numerators being omitted; but a point is placed on the left hand to distinguish them from integers. In reading them the first is called 5-tenths, the second 25-hundredths, and the third 325-thousandths.

When there are not so many figures in the numerator as there are cyphers in the denominator, as many cyphers as are necessary must be prefixed: thus $\frac{3}{100}$=·03 and $\frac{3}{1000}$=·003.

Cyphers on the left hand of a decimal *decrease* its value ten-fold: thus, 5 is 5-tenths; ·05 is 5-hundredths, and ·005 is 5-thousandths. Cyphers on the right do not alter the value, for ·5, ·50, ·500, are the same as $\frac{5}{10}$, $\frac{50}{100}$, $\frac{500}{1000}$, and these are of equal value.

ADDITION.

Rule.—Place the numbers to be added so that the decimal points be directly under each other, and add as in Simple Addition. Insert the point in the answer directly under the other points.

Add together the following numbers:—

(1)	(2)	(3)
2·13	43·27	820·71
·426	9·042	2·006
21·2	712·417	84·243
7·63	41·007	217·072
640·072	·962	9·341

4. Add 4·231, 72·32, 920·74, ·9374, 376·05.
5. 723·312, 91·0006, 2·0251, 3724·7, ·00007.
6. 37·214, ·736, 7213·04, 123·476, 21·6743.
7. 800·273, ·498·0009, ·296, ·0071, 4260·008.
8. 320·492, ·23687, 970·0083, 9·086, 41·762.

SUBTRACTION.

Rule.—Place the numbers as in addition; subtract as in Simple Numbers, and insert the point under the other points.

1	From 72·378	take 4·861	6.	From 279·712	take 97·0076
2.	9·007	·962	7.	72·0076	1·973
3.	41·217	7·0968	8.	900·005	89·1171
4.	298·012	·9999	9.	243·21	·964213
5.	840·001	170·98	10.	462·0068	134·791

MULTIPLICATION.

Rule.—Arrange the factors, and multiply as in Whole Numbers. Reckon the number of decimals in both factors, and point off as many from the right of the product. When the number of figures in the product is not so many as the number of decimals in both factors, as many cyphers as may be necessary to make up the deficiency must be placed at the left of the product.

Multiply 7·4 by ·35.

$$\begin{array}{r} 7{\cdot}4 \\ \underline{{\cdot}35} \\ 370 \\ \underline{222} \\ 2{\cdot}590 \end{array}$$

In the above example there are three decimal places in the multiplicand and multiplier; therefore three figures are pointed off from the right of the product.

Multiply ·045 by ·03.

$$\begin{array}{r} {\cdot}045 \\ \underline{{\cdot}03} \\ {\cdot}00135 \end{array}$$

In the above example there are five decimal places in the factors, and only three figures in the product; therefore two cyphers are placed at the left of the product to make the number of decimal places in the product equal to those in the factors.

1. Mult.	·27 by	·27	7. Mult.	2300·7 by	48·003
2.	4·21	3·41	8.	704·23	·0007
3.	97·04	80·03	9.	·786	100
4.	·4102	·1004	10.	4·862	·75
5.	·700	·806	11.	200·03	·002
6.*	·879	10	12.	·00076	1000

DIVISION.

Rule.—Divide as in whole numbers. Point off as many decimal places in the quotient, as the dividend has more than the divisor: if necessary place cyphers to the left of the quotient.

If the divisor has more figures than the dividend, add cyphers to the right of the dividend.

When there is a remainder, the quotient may be carried to any degree of exactness, by annexing cyphers to the remainder.

Divide 4·7614 by 3·8

3·8)4·7614 (1·253

In this case the decimals in the dividend exceed those in the divisor by three; three figures are therefore marked off in the quotient

Divide ·7644 by 42

42)·7644(·0182

In this case the decimals in the dividend exceed those in the divisor by four; a cypher is therefore prefixed in the quotient to make four decimal places.

1. Divide	6·74 by	2·34	7. Divide	724·1 by	38·07
2.	·496	·278	8.	82·03	9·0002
3.	7·6	·734	9.	7·624	2·001
4.	7·23	4·06	10.	·5213	·24121
5.	·024	·001	11.	31	·124689
6.†	29·6	10	12.	3468·9	1000

---

* In order to multiply a decimal by 10, remove the point one figure to the *right*; if by 100 remove it two places, and so on.

† To divide by 10, 100, &c., remove the decimal place of the dividend as many places to the *left* as there are cyphers.

REDUCTION.

Case I.—*To reduce a vulgar fraction to a decimal.*

Rule.—Divide the numerator by the denominator; annexing as many cyphers to the numerator as may be necessary. Point off as many decimal places in the quotient, as there were cyphers annexed to the numerator.

Reduce $\frac{1}{2}$ to a decimal.

$$2\overline{)10}$$
$$\cdot 5 \text{ Ans.}$$

Reduce $\frac{3}{4}$ to a decimal.

$$4\overline{)300}$$
$$\cdot 75 \text{ Ans.}$$

1. Reduce $\frac{5}{8}$ to a decimal.
2 $\frac{1}{4}$
3. $\frac{7}{8}$
4. $\frac{1}{3}$
5. $\frac{5}{6}$
6. $\frac{1}{6}$

7. Reduce $\frac{9}{16}$ to a decimal.
8. $\frac{1}{75}$
9. $\frac{16}{17}$
10. $\frac{8}{11}$
11. $\frac{275}{3842}$
12. $\frac{1}{1875}$

Case II.—*To reduce a decimal to a vulgar fraction.*

Rule.—Make the given decimal the numerator, and place under it, for a denominator, a unit with as many cyphers as there are figures in the decimal.

Reduce ·5 to a vulgar fraction.

$\frac{5}{10}$ *Ans.*

Reduce ·078 to a vulgar frac.

$\frac{78}{1000}$ *Ans.*

1. Reduce ·25 to a vulgar frac.
2. ·625
3. ·375
4. ·005
5. ·01

6. Reduce ·001 to a vulg. frac.
7. ·41
8. ·021
9. ·007
10. ·019

Case III.—*To reduce numbers of a lower denomination to the decimal of a higher.*

Rule.—Write the given numbers, if more than one, directly under each other, beginning with the lowest, and divide by as many of the lower as make one of the higher, annexing cyphers if necessary.

Reduce 12*s*. 3*d*. to the decimal of a pound.

12) 3·00
20) 12·250
·6125 *Ans.*

Here the shillings and pence are placed under each other, beginning with the lower; and each divided by as many of the lower as make one of the higher.

Reduce 16*s*. 6¾*d*. to the decimal of a pound.

4) 3·00
12) 6·7500
20) 16·56250
·828125 *Ans.*

Here the farthings, pence, and shillings, are placed under each other, beginning with the lowest; each is then divided by as many of the lower as make one of the higher.

1. Reduce 19*s*. 5½*d*. to the decimal of a pound.
2. Reduce 15*s*. 9¾*d*. to the decimal of a pound.
3. Reduce 13*s*. 4*d*. to the decimal of a pound.
4. Reduce 9*d*. to the decimal of a pound.
5. Reduce 3 cwt. 2 qrs. 8 lbs. to the decimal of a cwt.
6. Reduce 4 feet 3 inches, to the decimal of a yard.
7. Reduce 26 min. 34 sec. to the decimal of a week.
8. Reduce 5 furlongs 3 poles, to the decimal of a mile.
9. Reduce 4¾*d*. to the decimal of a guinea.
10. Reduce 5 dwt. 12 grs. to the decimal of an ounce.
11. Reduce 2 roods 12 perches, to the decimal of an acre.
12. Reduce 17 yards, 1 foot, 6 inches, to the decimal of a mile.

Case IV.—*To find the value of a decimal.*

Rule.—Multiply the decimal by as many of the next lower denomination as make one of the given denomination. Point off, from the product, as many decimal places as are in the given decimal. Proceed thus to the lowest denomination. The figures on the left of the points are the value of the decimal.

What is the value of ·427 of a pound	What is the value of ·243 of a day.
·427	·243
20	·24
8·540	5·832
12	60
6·480	49·920
4	60
1·920	55·200
Ans. 8s. 6¼d	*Ans.* 5 hrs. 49 min. 55 sec.

1. What is the value of ·7634*l.* ?
2. What is the value of ·3412*l.* ?
3. What is the value of ·0076*l.* ?
4. What is the value of ·764 cwt. ?
5. What is the value of ·936 lbs. avoirdupois ?
6. What is the value of ·007 ton ?
7. What is the value of ·732 shilling ?
8. What is the value of ·079 crown ?
9. What is the value of ·9218 day ?
10. What is the value of ·496 yard ?
11. What is the value of ·0796 mile ?
12. What is the value of ·732 lb. troy ?
13. What is the value of ·987 oz. avoirdupois ?
14. What is the value of ·987 oz. troy ?
15. What is the value of ·779 lbs. avoirdupois ?

INVOLUTION.

When a number is multiplied by itself, the product is called the power, and the number multiplied the root. Thus 2×2=4: here 4 is the square or second power of the root 2. Again, 2×2×2=8: here 8 is the cube or third power of the root 2. Again, 2×2×2×2=16, here 16 is the fourth power of the root 2.

1. Find the second power of 8.
2. Required the third power of 13.
3. Raise 32 to the fourth power.
4. Involve 19 to the fifth power.
5. Involve 33 to the sixth power.

EVOLUTION.

Evolution is the method of finding the roots of numbers.

EXTRACTION of the SECOND or SQUARE ROOT.

To extract the square root of any given number, is to find a number, which, when multiplied by itself, will produce the given number.

What is the square root of 106929?

Rule with Example.—Divide the given number into periods of two figures each, by placing a point over the unit figure, and over every alternate figure towards the left. Find the square root, 3, of the first period, 10, and place it in the quotient. Subtract the square of it, 9, from the first period, and to the remainder annex the next period, 69, for a

$$\begin{array}{rl} & \dot{1}0\dot{6}9\dot{2}9\ (327 \\ & 9 \\ 62) & \overline{169} \\ & 124 \\ 647) & \overline{4529} \\ & 4529 \\ & \overline{} \end{array}$$

dividend. Double the root already found, 3, for a divisor, and supposing the unit figure, 9, omitted, find how often it, viz. 6, is contained in the dividend. It is contained 2 times; place the 2 then *both* in the quotient and the divisor. Multiply by it, 2, the divisor, 62, and subtract the product, 124, from the dividend. Bring down another period, and proceed thus till all the periods are brought down.

If there be a remainder after all the periods are used, periods of cyphers may be annexed; when the result will be decimals. Should there be decimals in the given number, still the pointing is to begin from the unit's place of the *integers*, and a point to be placed over every alternate figure both right and left.

The square root of a fraction is found by extracting the square root of the numerator for a new numerator, and the root of the denominator for a new denominator; if, however, this cannot be done, let the fraction be reduced to a decimal and the root extracted as before.

1. What is the square root of 30976?
2. What is the square root of 622521?
3. What is the square root of 1234321?
4. What is the square root of 2052·09?
5. What is the square root of 4795·25731?
6. What is the square root of 24674·1264?
7. What is the square root of $\frac{49}{144}$?
8. What is the square root of $\frac{196}{1369}$?

EXTRACTION OF THE THIRD, OR CUBE ROOT.

To extract the Cube Root of any given number is to find a number which, when multiplied twice by itself, will produce the given number.

Find the Cube Root of 12812904.

12812904(234
8
4812
$2\times2=4\times300=1200$
$2\times3=6\times\ 30=\ 180$
$3\times3\qquad\quad=\quad 9$
$1389\times3=4167$
645904
$23^2\times300\quad=158700$
$23\ \times4\times30=\ 2760$
$4^2\qquad\quad=\quad 16$
$161476\times4=\ 645904$
0

Rule with Example.—Divide the given number into periods of three figures, beginning at the place of units. Place the cube root of the first period 2, in the quotient, and subtract its cube 8, from the first period, and bring down the next period for a dividend, which is 4812, to find a divisor, multiply the square of the figure placed in the quotient by 300,=1200; find how often this is contained in the dividend, viz. 3 times; place the 3 in the quotient for the second figure of the root. Multiply the part of the root formerly found, viz., 2, by the last figure placed in the root, viz., 3, and the product by 30,=180; add this and the square of the last figure placed in the root to the divisor, viz., 1200; multiply the sum of these, 1389, by the last figure placed in the root, 3, and subtract the product, 4167, from the dividend, 4812; bring down another period for a new dividend, and proceed in the same manner.

In order to extract the cube root of a vulgar fraction reduce it to a decimal, and then extract the root.

In mixed numbers reduce the fractional part to a decimal.

Find the cube root of the following numbers :—

1. of	373248	6. of	52734·375
2. —	54872	7. —	7834·8748
3. —	389017	8. —	·053157376
4. —	1092727	9. —	$\frac{4}{7}$
5. —	84604519	10. —	$7\frac{1}{5}$

DUODECIMAL MULTIPLICATION:

This rule is made use of by artificers in measuring their work. The dimensions are taken in feet, inches and parts. The foot is divided into 12 parts called inches; the inch into 12 parts called seconds; the seconds into 12 parts called thirds; and the thirds into 12 parts called fourths. Three seconds are marked thus, 3″; thirds, thus 3‴; and fourths thus, 3⁗.

Multiply 7 feet 6¾ inches by 2 feet 5¼ inches.

Rule with Example.—Place the multiplier under the multiplicand, feet under feet, inches under inches, &c. Multiply the multiplicand, beginning at the lowest term, 9, by the highest term in the multiplier, 2, carrying by 12; then multiply by the next lower term in the multiplier, viz., 5 inches, taking care, however, to put the product one place towards the right hand. Do the same with the next lower term, and so on. Add the different products together.

ft.	*in.*	″		
7	6	9[*]		
2	5	3		
15	1	6		
3	1	9	9	
	1	10	8	3
18	5	2″	5‴	3⁗

1. Multiply 7 feet 9 inches, by 5 feet 6 inches.

2. Multiply 9 feet 5 inches 3″, by 4 feet 8 inches 6″.

3. Multiply 12 feet 8 inches 7″, by 8 feet 4 inches 9″.

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[*] Instead of ¾ inches 9″ are put down, because they are equivalent. The same is done with the ¼ inch.

4. Multiply 46 feet 11 inches 8″, by 12 feet 7″.

5. Multiply 87 feet 9½ inches, by 11 feet 10¼ inches.

6. Multiply 687 feet 7¾ inches, by 24 feet 10½ inches.

To find the superficial content multiply the length by the breadth.

7. Find the content of a board 8 feet 4 inches long and feet 4 inches broad.

8. Find the area of a table 10 feet 9 inches long, and 6 feet 4 inches broad.

9. What is the price of a marble slab, the length of which is 6 feet 4 inches, the breadth 3 feet 2 inches, at 7*s.* per foot?

10. Required the area of a square, the side of it being 23 feet 9 inches?

11. A grave-stone was charged at 5*s.* 2*d.* per foot; what was the price of it, the length of it being 7 feet 2 inches, the breadth 3 feet 6 inches?

12. How much will it cost to pave a court-yard at 7*s.* 8*d.* per foot, the length of it being 26 feet 9 inches, the breadth 12 feet 4 inches?

To find the solid content multiply the length, breadth, and thickness together.

13. What is the solid content of a block of marble 9 feet 2 inches long, 5 feet 8 inches broad, and 2 feet 3 inches thick?

14. Required the solid content of a box 6½ feet long, 4¾ feet broad, and 3¼ feet deep?

15. A log of mahogany is 72 feet 7½ inches long, 5 feet 6¼ inches broad, and 8 feet 6⅓ inches thick. Required its solid content?

16. What would it cost having a cellar dug 18 feet 4 inches long, 12 feet 9 inches broad, and 9 feet 6 inches deep, at 6*d.* per solid yard?

17. Required the solid content of a log of beech, 27 feet 6 inches long, 2 feet 5 inches broad, and 1 foot 2 inches thick?

18. What is the value of a block of granite 8 feet 9 inches long, 3 feet 7 inches broad, and 4 feet 2 inches thick, at 7*s.* 6*d.* the solid foot?

MENTAL ARITHMETIC.

1.—*To find the value of* 12 *articles, the price of one being given.*

Rule.—Reckon every penny in the price a shilling, and every farthing three pence.

Because the value of 12 articles at 1d. each is 12d., or 1s.

			Ans.				Ans.
12 @	6d.	each	6s.	24 @	7d.	each	14s.
12 —	8d.	—	8s.	24 —	6¼d.	—	12s. 6d.
12 —	13d.	—	13s.	36 —	9d.	—	27s.
12 —	4¼d.	—	4s. 3d.	36 —	10½d.	—	31s. 6d.
12 —	5½d.	—	5s. 6d.	12 —	1s. 4¼d.	—	16s. 3d.
12 —	7¾d.	—	7s. 9d.	12 —	1s. 7¾d.	—	19s. 9d.
12 —	15¼d.	—	15s. 3d.	24 —	1s. 3d.	—	30s.
12 —	16½d.	—	16s. 6d.	24 —	2s. 1d.	—	50s.
12 —	17¾d.	—	17s. 9d.	48 —	1s. 3d.	—	60s.
12 —	19½d.	—	19s. 6d.	72 —	1s. 8d.	—	120s.
*120 —	3d.	—	30s.	720 —	5d.	—	300s.
120 —	7d.	—	70s.	840 —	7d.	—	490s.
240 —	8d.	—	160s.	960 —	6d.	—	480s.
360 —	7d.	—	210s.	1080 —	7d.	—	630s.
480 —	9d.	—	360s.	1200 —	8d.	—	800s.
600 —	11d.	—	550s.	1320 —	9d.	—	990s.

When there are a few over or under the dozen, calculate for a dozen, and add or subtract as may be required.

			Ans.				Ans.
13 @	4d.	each	4s. 4d.	25 @	4d.	each	8s 4d.
14 —	5d.	—	5s. 10d.	26 —	9d.	—	19s. 6d.
11 —	6d.	—	5s. 6d.	23 —	3d.	—	5s. 9d.
10 —	6d.	—	5s.	22 —	7d.	—	12s. 10d.
9 —	8d.	—	6s.	37 —	1s. 3d.	—	46s. 3d.
15 —	10d.	—	12s. 6d.	35 —	1s. 4d.	—	46s. 8d.

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* In this case find the answer for one dozen and take it ten times.

II.—*To find the price of a gross, the price of one article being given.*

Rule.—Reckon the pence in the price of one article as shillings, and the number of pence in these shillings will be the price of a gross in shillings.

Because taking the pence in the price as shillings is the same as multiplying by 12, and taking these shillings as pence again is the same as multiplying by 12 another time, and 12×12=144=1 gross.

				Ans.					*Ans.*
1	gross @	4*d.*	each	48*s.*	1	gross @	8¼*d.*	each	99*s*
1	— —	2½*d.*	—	30*s.*	1	— —	9½*d.*	—	114*s*
1	— —	3¼*d.*	—	39*s.*	1	— —	11¾*d.*	—	141*s.*
1	— —	7¾*d.*	—	93*s.*	1	— —	12¼*d.*	—	147*s.*

III.—*To find the price per score, the price of one article being given.*

Rule.—Reckon a pound for every shilling in the price. Thus, there being 20 cwt. in a ton, the price of 1 ton at 7*s.* 6*d.* per cwt. is 7*l.* 10*s.*

			Ans.				*Ans.*
20 lbs.	@	4*s.* per lb.	4*l.*	*200 lbs.	@	6*s.* per lb.	60*l.*
20	— —	5*s.* 6*d.* —	5*l.* 10*s.*	200	——	5*s.* 6*d.* —	55*l.*
40	— —	6*s.* 3*d.* —	12*l.* 10*s.*	400	——	7*s.* 3*d.* —	145*l.*
60	— —	2*s.* 3*d.* —	6*l.* 15*s.*	600	——	9*s.* 9*d.* —	292*l.* 10*s.*
80	— —	4*s.* 6*d.* —	18*l.*	800	——	12*s.* —	480*l.*
100	— —	5*s.* 3*d.* —	26*l.* 5*s.*	1000	——	2*s.* 3*d.* —	112*l.* 10*s.*

IV.—*To find the value of* 100 *articles, the price of one being given.*

Rule.—For every farthing in the price take as many pence, and twice as many shillings. Thus, 100 pencils at 1½*d.* each is 12*s.* 6*d.*, 6 being the number of farthings.

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* In this case find the value of one score, and take it ten times for wer.

Because, by taking a penny for every farthing is the same as multiplying by 4, and taking 2 shillings for every farthing is the same as multiplying by 96, and 96+4=100.

			Ans.				*Ans.*
100.	@ 2*d.*	each	16*s.* 8*d.*	100	@ 4½*d.*	each	37*s.* 6*d.*
100.	— 2¼*d.*	—	18*s* 9*d.*	100	— 5¾*d.*	—	47*s.* 11*d.*
100.	— 3½*d.*	—	29*s.* 2*d.*	100	— 6¼*d.*	—	52*s.* 1*d.*

V.—*To find the price of one article, the rate per dozen being given.*

Rule.—Reckon a penny for every shilling in the rate per dozen.

			Ans.				*Ans.*
1	@ 12*s.*	per doz.	12*d.*	1	@ 4*s.* 3*d*	per doz.	4¼*d.*
1	— 4*s.*	—	4*d.*	1	— 7*s.* 6*d.*	—	7½*d.*
1	— 7*s.*	—	7*d.*	1	—10*s.* 9*d.*	—	10¾*d.*
1	— 13*s.*	—	13*d.*	2	— 4*s.* 3*d.*	—	8½*d.*
1	— 14*s.*	—	14*d.*	3	— 7*s.* 6*d.*	—	22½*d.*
1	— 18*s.*	—	18*d.*	6	— 8*s.*	—	4*s.*
2	— 6*s.*	—	12*d.*	13	— 9*s.*	—	9*s.* 9*d.*
3	— 8*s.*	—	24*d.*	11	— 7*s.*	—	6*s.* 5*d.*

VI.—*To find the price of one article, the price per gross being given.*

Rule.—Reckon the shillings of the price as pence, and divide them by 12.

Because taking the shillings as pence and dividing them by 12 is equal to dividing twice by 12, or 144.

			Ans.				*Ans.*
1	@ 48*s.*	per gross	4*d.*	1	@ 99*s.*	per gross	8¼*d.*
1	— 30*s.*	—	2½*d.*	1	— 114*s.*	—	9½*d.*
1	— 39*s.*	—	3¼*d.*	1	— 141*s.*	—	11¾*d.*
1	— 93*s.*	—	7¾*d.*	1	— 147*s*	—	12¼*d.*

VII.—*To find the value of a single article at a certain rate per score.*

Rule.—Reckon a shilling for every pound in the price.

				Ans.					*Ans.*
1	@	4*l.*	per score	4*s.*	2	@	4*l.* 5*s.*	per score	8*s.* 6*d*
1	—	9*l.*	—	9*s.*	1	—	7*l.* 7*s.* 6*d.*	—	7*s.* 4½*d*
1	—	9*l.* 10*s.*	—	9*s.* 6*d*	1	—	6*l.* 17*s.* 6*d.*	—	6*s* 10½*d*
1	—	14*l.* 15*s.*	—	14*s.* 9*d*	1	—	3*l.* 13*s.* 4*d.*	—	3*s.* 8*d*
1	—	27*l.* 5*s.*	—	27*s.* 3*d*	1	—	7*l.* 6*s.* 8*d.*	—	7*s.* 4*d*
1	—	30*l.* 15*s.*	—	30*s.* 9*d*	21	—	2*l.* 10*s.*	—	2*l.* 12*s.* 6*d*
4	—	35*l.* 15*s.* 10*d*	—	7*l.* 3*s.* 2*d*	40	—	8*l.* 17*s.* 4*d.*	—	17*l.* 14*s.* 8*d*
5	—	36*l.* 16*s.* 8*d*	—	9*l.* 4*s.* 2*d*	60	—	3*l.* 15*s.* 2¼*d.*	—	11*l.* 5*s.* 6¾*d*
10	—	42*l.* 18*s.* 6*d*	—	21*l.* 9*s.* 3*d*	80	—	2*l.* 5*s.* 1*d.*	—	9*l.* 0*s.* 4*d*

VIII.—*To find the value of any number of articles when the price is given in pence or shillings.*

Rule.—If the price be in pence, consider the number of articles as pence, and multiply by the pence in the price. If the price be in shillings, consider the number of articles as shillings, and multiply by the shillings in the price. Thus, 96 articles at 3*d.* each is 24*s.*, because 96 pence is 8*s.*, and 8×3=24. Again, 80 articles at 3*s.* each is 12*l.*, because 80*s.* is 4*l.*, and 4×3=12.

				Ans.					*Ans.*
36	@	3*d.*	each	9*s.*	40	@	3*s.*	each	6*l.*
60	—	5*d.*	—	25*s.*	100	—	7*s.*	—	35*l.*
120	—	7*d.*	—	70*s.*	140	—	10*s.*	—	70*l.*
144	—	8*d.*	—	96*s.*	300	—	8*s.*	—	120*l.*
54	—	6*d.*	—	27*s.*	180	—	12*s.*	—	108*l.*
66¼	—	4*d.*	—	22*s.* 1*d.*	900	—	6*s.*	—	270*l.*
100½	—	8*d.*	—	67*s.*	86	—	10*s.*	—	43*l.*
58¾	—	9*d.*	—	44*s.* 0¾*d.*	165	—	4*s.*	—	33*l.*

IX.—*To find what any number of pence per day will amount to in a year.*

Rule.—Add together as many pounds, half pounds, four pences, and pence, as there are pence per day. Thus, 3*d.* per day is 3 pounds, 3 half pounds, 3 four-pences, and 3 pence in a year; that is, 4*l.* 11*s.* 3*d.*

Because 1*l.*=240*d.*, 10*s.*=120*d.*, 4*d.* and 1*d.*
And 240+120+4+1=365.

Or take 365 as pence; that is, 1*l.* 10*s.* 5*d.*, and multiply this by the number of pence per day.

					Ans.	
365	days @	2*d.*	per day	3*l.*	0*s.*	10*d.*
365	——	4*d.*	——	6*l.*	1*s.*	8*d.*
365	——	5*d.*	——	7*l.*	12*s.*	1*d.*
365	——	6*d.*	——	9*l.*	2*s.*	6*d.*
365	——	7*d.*	——	10*l.*	12*s.*	11*d.*
365	——	8*d.*	——	12*l.*	3*s.*	4*d.*
365	——	9*d.*	——	13*l.*	13*s.*	9*d.*
365	——	10*d.*	——	15*l.*	4*s.*	2*d.*
365	——	16*d.*	——	24*l.*	6*s.*	8*d.*
365	——	18*d.*	——	27*l.*	7*s.*	6*d.*
*½	year @	14*d.*	——	10*l.*	12*s.*	11*d.*
¼	——	20*d.*	——	7*l.*	12*s.*	1*d.*

X.—*To find what any number of pence per day will amount to in* 313 *days, which, omitting Sundays, is the number of days in a year.*

Rule.—Add together as many pounds, crowns, shillings, and pence, as there are pence per day. Thus, 3 pence per day is 3 pounds, 3 crowns, 3 shillings, and 3 pence per year of 313 days; that is, 3*l.* 18*s.* 3*d.*

Because 1*l.*=240*d.*, 1 crown=60*d.*, 1*s.*=12*d.*, 1*d.*
And 240 + 60 + 12 + 1=313

Or, multiply 1*l.* 6*s.* 1*d.*,=313*d.*, by the number of pence per day.

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* In this case take half the number of pence per day, and calcul for a whole year.

					Ans.	
313	days at	2*d.*	per day	2*l.*	12*s.*	2*d.*
313	——	3*d.*	——	3*l.*	18*s.*	3*d.*
313	——	6*d.*	——	7*l.*	16*s.*	6*d.*
313	——	7*d.*	——	9*l.*	2*s.*	7*d.*
313	——	13*d.*	——	16*l.*	19*s.*	1*d.*
313	——	14*d.*	——	18*l.*	5*s.*	2*d.*
313	——	20*d.*	——	26*l.*	1*s.*	8*d.*
313	——	60*d.*	——	78*l.*	5*s.*	0*d.*

Should there be farthings in the rate per day, add for every farthing in the rate 7*s.* 7¼*d.* for 365 days, and 6*s.* 6¼*d.* for 313 days.

Because 7*s.* 7¼*d.*=365 farthings, and 6*s.* 6¼*d.*=313 farthings.

					Ans.	
365	days at	2¼*d.*	per day	3*l.*	8*s.*	5¼*d.*
365	——	3¼*d.*	——	4*l.*	18*s.*	10¼*d.*
365	——	6½*d.*	——	9*l.*	17*s.*	8½*d.*
313	——	2¼*d.*	——	2*l.*	18*s.*	8¼*d.*
313	——	3¼*d.*	——	4*l.*	4*s.*	9¼*d.*
313	——	6½*d.*	——	8*l.*	9*s.*	6½*d.*

XI.—*To find what any number of shillings per week will amount to in a year.*

Rule.—Add together twice and half as many pounds, and twice as many shillings, as there are shillings per week. Thus, 6*s.* per week is 15*l.* 12*s.* ; for twice as many pounds is 12*l.*, and half as many pounds is 3*l.*, and twice as many shillings is 12*s.*, and 12*l.*+3*l.*+12*s.*=15*l.* 12*s.*

Because 52, the number of weeks in a year, is equal to 20+20+10+2.

				Ans.						*Ans.*
1	year @	4*s.*	per week	10*l.* 8*s.*	1	year @	10*s.*	per week	26*l.*
1	——	5*s.*	——	13*l.*	1	——	11*s.*	——	28*l.* 12*s.*
1	——	6*s.*	——	15*l.* 12*s.*	1	——	12*s.*	——	31*l.* 4*s.*
1	——	7*s.*	——	18*l.* 4*s.*	1	——	16*s.*	——	41*l.* 12*s.*
1	——	8*s.*	——	20*l.* 16*s.*	1	——	17*s.*	——	44*l.* 4*s.*
1	——	9*s.*	——	23*l.* 8*s.*	1	——	19*s.*	——	49*l.* 8*s.*

XII.—*To find what any number of pence per week will amount to in a year.*

Rule.—Take 4 times as many shillings, and 4 times as many pence, as there are pence per week, and if there be farthings in the rate add 1*s.* 1*d.* for every farthing.

Because 52*d.*=4*s.* 4*d.*, and 52 farthings=13*d.* or 1*s.* 1*d.*

				Ans.					*Ans.*
1	year @	2*d.*	per week	8*s.* 8*d.*	1	year @	2¼*d.*	per week	9*s.* 9*d.*
1	——	3*d.*	——	13*s.*	1	——	3½*d.*	——	15*s.* 2*d.*
1	——	4*d.*	——	17*s.* 4*d.*	1	——	4¼*d.*	——	18*s.* 5*d.*
1	——	7*d.*	——	30*s.* 4*d.*	1	——	7¾*d.*	——	33*s.* 7*d.*
1	——	9*d.*	——	39*s.*	1	——	9½*d.*	——	41*s.* 2*d.*
1	——	11*d.*	——	47*s.* 8*d.*	1	——	11¾*d.*	——	50*s.* 11d.

XIII.—*To find the value of a pound, the price per oz. being given.*

Rule.—If it be a pound avoirdupois, divide the farthings in the price per oz. by 3, for the answer in shillings; if it be a pound troy, divide by 4.[*]

Because, taking the farthings as shillings is multiplying by 48; now 48÷3=16 oz. in lb. avoirdupois; and 48÷4=12 lb. troy.

1	lb. avoir @	1½*d.*	per oz.	2*s.*	1	lb. troy @	4*d.*	per oz.	4*s.*
1	——	2*d.*	——	2*s.* 8*d.*	1	——	2½*d.*	——	2*s.* 6*d.*
1	——	3*d.*	——	4*s.*	1	——	6¾*d.*	——	6*s.* 9*d.*
1	——	5*d.*	——	6*s.* 8d.	1	——	7¼*d.*	——	7*s.* 3*d.*
1	——	7½*d.*	——	10*s.*	1	——	9½*d.*	——	9*d.* 6*d.*
1	——	10¾*d.*	——	14*s.* 4*d.*	1	——	11¾*d.*	——	11*s.* 9*d.*

XIV.—*To find the value of an ounce, the price per pound being given.*

Rule.—If it be an ounce avoirdupois, take the shillings as farthings and multiply by 3; if it be an ounce troy, multiply by 4.

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[*] This mode of finding the value of a lb. troy is put here merely to show the principle of the rule. It is, of course, better to find its value by Case I.

Because, taking the shillings as farthings is equal to dividing by 48 instead of 16; therefore we multiply by 3, for 16×3=48; and in the case of troy weight we multiply by 4, for 12×4=48.

					Ans.
1	lb. avoir.	at	2s.	per lb.	1½*d.*
1	——	—	1*s.*	—	0¾*d.*
1	——	—	3*s.*	—	2¼*d.*
1	——	—	6*s.*	—	4½*d.*
1	——	—	9*s.*	—	6¾*d.*
1	——	—	10*s.*	—	7½*d.*

					Ans.
[*] 1	oz. troy	at	2*s.*	per lb.	2*d.*
1	——	—	1*s.*	—	1*d.*
1	——	—	3*s.*	—	3*d.*
1	——	—	6*s.*	—	6*d.*
1	——	—	9*s.*	—	9*d.*
1	——	—	10*s.*	—	10*d.*

XV.—*To find the value of a hundred weight, or 112 lbs., the price per lb. being given.*

Rule.—Take 9 times as many shillings, and 4 times as many pence, as there are pence in the price per lb.

Because 9*s.* 4*d.*=112*d.*

				Ans.
1	cwt. at	2*d.*	per lb.	18*s.* 8*d.*
1	——	3*d.*	—	28*s.*
1	——	6*d.*	—	56*s.*
1	——	4*d.*	—	37*s.* 4*d.*
1	——	5*d.*	—	46*s.* 8*d.*
1	——	1*d.*	—	9*s.* 4*d.*

				Ans.
1	cwt. at	7*d.*	per lb.	65*s.* 4*d.*
1	——	8*d.*	—	74*s.* 8*d.*
1	——	9*d.*	—	84*s.*
1	——	10*d.*	—	93*s.* 4*d.*
1	——	11*d.*	—	102*s.* 8*d.*
1	——	12*d.*	—	112*s.*

XVI.—*To find the value of a lb., the price per cwt. being given.*

Rule.—Multiply the shillings in the price by 3 and divide by 7 for the price of a lb. in farthings.

Because taking the shillings as farthings is the same as dividing by 48, and dividing by 48 and by 7, and multiplying by 3, is the same as dividing by 112.

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[*] Better to do this by Case II.

	Ans.		*Ans.*
1 lb. at 7*s.* per cwt.	0¾*d.*	1 lb. at 3*l.* per cwt.	6¼*d.*+
1 —— 9*s.* ——	0¾*d.*+	1 —— 3*l.* 10*s.* ——	7½*d.*
1 —— 11*s.* ——	1*d.* +	1 —— 4*l.* 9*s.* ——	9½*d.*+
1 —— 1*l.* 5*s.* ——	2½*d.*+	1 —— 5*l.* 15*s.* ——	12¼*d.*+
1 —— 2*l.* 6*s.* ——	4¾*d.*+	1 —— 10*l.* 8*s.* ——	22¼*d.*+

XVII.—*To find the value of a ton, the price per lb. being given.*

Rule.—Find the value of 1 cwt., by Case XV., and take shillings in the price of a cwt. as pounds. For every 4*d.* add 6*s.* 8*d.*

	Ans.		*Ans.*
1 ton at 1*d.* per lb.	9*l.* 6*s.* 8*d.*	1 ton at 7*d.* per lb.	65*l.* 6*s.* 8*d.*
1 — 3*d.* —	28*l.*	1 — 8*d.* —	74*l.* 13*s.* 4*d.*
1 — 6*d.* —	56*l.*	1 — 9*d.* —	84*l.*
1 — 2*d.* —	18*l.* 13*s.* 4*d.*	1 — 10*d.* —	93*l.* 6*s.* 8*d.*
1 — 4*d.* —	37*l.* 6*s.* 8*d.*	1 — 11*d.* —	102*l.* 13*s.* 4*d.*
1 — 5*d.* —	46*l.* 13*s.* 4*d.*	1 — 12*d.* —	112*l.*

XVIII.—*To find the interest or discount upon any sum at 5 per cent per annum.*

Rule.—Reckon a shilling for every pound, and 3*d.* for every 5*s.*

	Ans.		*Ans.*
12*l.* at 5 per cent	12*s.*	26*l.* 5*s.* at 5 per cent	1*l.* 6*s.* 3*d.*
42*l.* — ,, ——	42*s*	47*l.* 10*s.* — ,, ——	2*l.* 7*s.* 6*d.*
68*l.* — ,, ——	3*l.* 8*s.*	69*l.* 15*s.* — ,, ——	3*l.* 9*s.* 9*d.*
75*l.* — ,, ——	3*l.* 15*s.*	87*l.* 5*s.* — ,, ——	4*l.* 7*s.* 3*d.*
110*l.* — ,, ——	5*l.* 10*s.*	99*l.* 15*s.* — ,, ——	4*l.* 19*s.* 9*d.*
98*l.* — ,, ——	4*l.* 18*s.*	108*l.* 10*s.* — ,, ——	5*l.* 8*s.* 6*d.*

XIX.—*To find the interest on any sum at 5 per cent per annum for months.*

Rule.—Take the pounds as pence and multiply these pence by the number of months, for the answer in pence.

Int. on	*Ans.*	Int. on	*Ans.*
4*l.* for 2 mths.	8*d.*	84*l.* for 4 mths.	28*s.*
7*l.* — [illegible] ——	21*d.*	96*l.* 5*s.* — 3 ——	24*s.* 0¾*d.*
4*l.* 5*s.* — 2 ——	8½*d.*	108*l.* 15*s.* — 6 ——	54*s.* 4½*d.*
9*l.* 10*s.* — 3 ——	28½*d.*	120*l.* 10*s.* — 7 ——	70*s.* 3½*d.*
60*l.* — 7 ——	35*s.*	132*l.* 5*s.* — 8 ——	88*s.* 2*d.*
72*l.* — 9 ——	54*s.*	144*l.* 15*s.* — 9 ——	108*s.* 6¾*d.*

XX.—*To find the interest on any sum at 5 per cent for any number of days.*

Rule.—Multiply either the money or the days by one-third of the money or the days; reject the unit figure and you have the answer in pence. Thus, the interest of 27*l.* for 18 days: 27×6=16$\cancel{2}$=16*d.*; or 18×9=16$\cancel{2}$=16*d.* interest.

Int. on			*Ans.*	Int. on			*Ans.*
21*l.*	for	6 days	4*d.*	76*l.*	for	6 days	15*d.*
24*l.*	—	7 —	5½*d.*	85*l.*	—	15 —	42½*d.*
33*l.*	—	9 —	9¾*d.*	99*l.*	—	18 —	59½*d.*
41*l.*	—	12 —	16¼*d.*	159*l.*	—	27 —	143*d.*

XXI.—*To find the interest on any sum at 6 per cent for months.*

Rule.—Multiply the pounds and months; cut off the unit figure of the product, and the remainder will be the interest in shillings. The figure cut off is tenths of a shilling. Thus, the interest of 9*l.* at 6 per cent for 5 months is 9×5=4$\cancel{5}$=4$\frac{5}{10}$*s.*=4*s.* 6*d.*

Int. on	*Ans.*	Int. on	*Ans.*
7*l.* for 3 months	2*s.* 1*d.*	24*l.* for 6 months	14*s.* 4*d.*
12*l.* — 4 ——	4*s.* 9*d.*	32*l.* — 7 ——	22*s.* 4*d.*
16*l.* — 5 ——	8*s.*	64*l.* — 3 ——	19*s.* 2*d.*
270*l.* — 7 ——	9*l.* 9*s.*	90*l.* — 8 ——	72*s.*
350*l.* — 8 ——	14*l.*	380*l.* — 9 ——	17*l.* 2*s.*

ANSWERS.

NUMERATION.

1.] One—Two—Three—Four—Five—Six—Seven—Eight—Nine—Cypher.

2.] Ten—Eleven—Fourteen—Sixteen—Nineteen—Twenty—Forty-two—Eighteen—Seventeen.

3.] Two hundred—Four hundred and twenty—Six hundred and seven—Nine hundred and eighty-six—Four hundred and seventy-three—Two hundred and forty-seven—Three hundred and sixty-four.

4.] Nine hundred and twelve—Eight hundred and seventy-four—Seven hundred and eighty-three—Six hundred and fifty—Two hundred and two—Six hundred and four—Five hundred and ten.

5.] Four thousand—Two thousand seven hundred—Eight thousand six hundred and one—Seven thousand and thirty-six—Two thousand one hundred and one—One thousand and sixty.

6.] One thousand and ten—Seven thousand and thirty—Four thousand six hundred—Nine thousand one hundred and eleven—Four thousand and seventy-six—Five thousand eight hundred and seventy.

7.] Twenty-six thousand and twelve—Seventy thousand one hundred and one—Forty-two thousand one hundred—Thirty-six thousand one hundred—Ninety thousand two hundred and one.

8.] Seven hundred thousand—Seven hundred and one thousand and twenty—Nine hundred and twenty-six thousand four hundred and twenty-seven—One hundred and four thousand two hundred and six.

9.] Nine millions—Nine millions seven hundred and sixty-four thousand two hundred and sixty-eight—Eight millions two hundred and two thousand one hundred—Five millions twenty-three thousand and sixty-seven.

10.] Two millions six hundred thousand and sixty—Four millions one hundred and one thousand and ten—Two millions four thousand—One million four hundred and two thousand one hundred and forty-nine.

11.] Forty millions—Twenty-nine millions six hundred and two thousand six hundred and eighty-seven—Fifty millions twenty-six thousand and seventeen—One million six hundred and seventy thousand and twenty.

12.] Nine hundred and forty-one millions two hundred and sixty-eight thousand seven hundred and sixty-seven—Two hundred and sixty-seven millions six hundred and two thousand six hundred and seven—Four hundred and one million four hundred and sixty-seven thousand six hundred and eighty.

13.] Two hundred and ninety-six millions twenty-six thousand eight hundred and seventy-six—Seven hundred and ten millions twenty thousand and ten—Two hundred and seventy millions six hundred and three thousand and fifty.

14.] One thousand four hundred and two millions three hundred and sixty thousand seven hundred and forty—Three thousand four hundred and sixty millions seven hundred and sixty thousand and ten—Four thousand and twenty-three millions six hundred and one thousand four hundred and ninety-seven.

15.] Seven thousand and forty-two millions six hundred and three thousand seven hundred and fourteen—Five thousand and seventy-nine millions six hundred and seven thousand nine hundred and six—One thousand seven hundred and four millions seventy thousand six hundred.

16.] Eighty-one thousand four hundred and sixty-two millions three hundred and six thousand and twelve—Forty-six thousand and seven millions six hundred and eighty-seven thousand six hundred and eighty-one—Ninety-four thousand and eighty-six millions four hundred and twenty-one thousand three hundred and sixty.

17.] Fourteen thousand and twenty-three millions six hundred and forty-one thousand two hundred and one—Twenty thousand eight hundred and sixty millions two thousand and one—Forty thousand and two millions two hundred and two.

18.] Nine hundred and seven thousand and sixty millions two hundred and six thousand two hundred and four—Two hundred and forty thousand and twenty-six millions one hundred thousand two hundred and one—Five hundred and ninety thousand nine hundred and sixty millions one hundred and twenty-six thousand and twenty.

NOTATION.

1.] 6—7—9—8—5—10—12—14—16—18—20—19.

2.] 74—26—31—49—58—62—76—77—97—84—55—99.

3.] 100—104—244—691—750—909—999—802.

4.] 4000—4200—5352—6705—7050—9002—8080—6707.

5.] 10000—15560—19019—26595—38038—40040—56502—70777.

6.] 400000—400040—600707—980000—256975—700707—964259.

7.] 6000000—5493000—8040402—7493765—10010010—20240606—53053053—853948653—203406508—993000000.

SIMPLE ADDITION.

1.	1185	25.	105
2.	1246	26.	293
3.	1348	27.	408
4.	1465	28.	1475
5.	2249	29.	15388
6.	2072	30.	4257
7.	2341	31.	27731
8.	2856	32.	1658286
9.	975	33.	7861214
10.	1635	34.	536146
11.	1516	35.	75675
12.	1056	36.	311013
13.	34957	37.	£57821
14.	21867	38.	2246
15.	18068	39.	72
16.	10913	40.	204
17.	30154	41.	251
18.	18001	42.	68391
19.	20169	43.	2263
20.	14372	44.	£2197
21	411093	45.	162
22.	351624	46.	5681
23.	278538	47.	415
24.	248663	48.	£84

SIMPLE SUBTRACTION.

1.	184	31.	704026138872
2.	476	32.	424575325955
3.	342	33.	417801945959
4.	456	34.	416879998308
5.	536	35.	457555
6.	375	36.	1205995
7.	463	37.	3599244
8.	531	38.	57955
9.	96	39.	£8072
10.	90	40.	171
11.	16175	41	344
12.	18943	42.	172
13.	25972	43.	178
14.	70747	44.	106
15.	36919	45.	135
16.	78373	46.	799
17.	40253	47.	1386517
18.	38999	48.	11
19.	22984	49.	130
20.	15289	50.	740
21.	78359	51.	2830
22.	25292	52.	875334
23.	462121935	53	140 millions.
24.	435195169	54.	1572904
25.	73922070	55.	5320
26.	612663992	56.	602
27.	722995412	57.	1794
28.	91310919	58.	85
29.	313841778927	59.	133
30.	769808830048	60.	387

MIXED QUESTIONS IN ADDITION AND SUBTRACTION.

1.	83 left.	5.	415 got safe.
2.	2720 remain.	6.	221 remain.
3.	1557 returned.	7.	1244556 exceeds by
4.	162 to go.	8.	£287 remaining.

SIMPLE MULTIPLICATION.

1.	17104	23.	688289
2.	134574	24.	393308
3.	432265	25.	786616
4.	225804	26.	589962
5.	66276	27.	491635
6.	672608	28.	884943
7.	389304	29.	1179924
8.	748790	30.	1081597
9.	502557	31.	6823648
10.	1162248	32.	13386366
11.	574875	33.	23249952
12.	548668	34.	18221409
13.	350184	35.	23150412
14.	612822	36.	20896344
15.	787914	37.	19912230
16.	525276	38.	13825056
17.	262638	39.	56518416
18.	437730	40.	22039992
19.	875460	41.	57667632
20.	963006	42.	71550144
21.	1050552	43.	63221592
22.	196654	44.	74644808

45. 29050420
46. 48844096
47. 84393932
48. 430143168
49. 777566496
50. 359831304
51. 63073762
52. 41281053
53. 24294591
54. 28047414
55. 46350656
56. 575630377
57. 395494873
58. 649435896
59. 64008924
60. 3704412744
61. 403576660
62. 175320
63. £2912
64. 2592 feet.
65. 2303 letters.
66. 3168 bottles.
67. £3240
68. 4480 pop.
69. 3650 pence.
70. 2144
71. 81056
72. 783
73. 80
74. 1095 hours.
75. 56940
76. 768000
77. £155168
78. 111690 miles.

SIMPLE DIVISION.

1. 6911—1
2. 13752—4
3. 13281—1
4. 11517—1
5. 9553—2
6. 3186—2
7. 6426—8
8. 4206—1
9. 6368906
10. 5335955—2
11. 13771812—3
12. 7140973—5
13. 3906406—4
14. 5859550
15. 12667006—5
16. 478066—7
17. 5894371—5
18. 28236344—1
19. 18824229—2
20. 14118172—1
21. 11294537—4
22. 9412114—5

23. 8067527
24. 7059086— 1
25. 6274743— 2
26. 5647268— 9
27. 5133880— 9
28. 4706057— 5
29. 37484011— 1
30. 24989341
31. 18742005— 3
32. 14993604— 3
33. 12494670— 3
34. 10709717— 4
35. 9371002— 7
36. 8329780— 3
37. 7496802— 3
38. 6815274— 9
39. 6247335—
40. 26654—14
41. 41315—17
42. 40364—12
43. 24995— 2
44. 17862—35
45. 8703— 9
46. 6828—33
47. 4408—28
48. 10902—34
49. 1889—64
50. 3309—88
51. 3450—76
52. 1767—22
53. 1726—18
54. 1687— 8
55. 1649—31
56. 1613—38
57. 107–513
58. 92–728
59. 181—26
60. 143—30
61. 280—43
62. 149–387
63. 123–319
64. 355—73
65. 244–295
66. 204—91
67. 174—55
68. 141–265
69. 118–555
70. 209—41
71. 532–155
72. 101–846
73. 167–396
74. 216–355
75. 127–535
76. 10804—74
77. 1032–570
78. 9591–218
79. 9902–383
80. 7234–312
81. 700–1507
82. 857–1713
83. 3186—11
84. 953–2014
85. 2513–1409
86. 2587–1292

87.	954— 308	94.	670— 7
88.	1061—2116	95.	45— 2
89.	375—2602	96.	36 hours.
90.	418—7464	97.	266—20000
91.	2252—4000	98.	2066666— 30
92.	14—65474	99.	192268— 340
93.	290— 188	100.	925— 25

COMPOUND ADDITION.

	£.	s.	d.		£.	s.	d.
1.	328	10	0	12.	4002	18	9¼
2.	241	5	7	13.	0	15	4
3.	107	9	0¼	14.	1	10	5½
4.	3904	7	1¾	15.	9	5	6
5.	3621	13	6¾	16.	2	12	1
6.	2774	10	7¼	17.	4264	18	6
7.	4660	7	0¾	18.	503	10	5
8.	3560	17	11	19.	1868	11	3
9.	3717	18	9¼	20.	11912	2	3½
10.	4110	2	11¾	21.	9652	1	10½
11.	4284	11	6¾	22.	17	17	1

COMPOUND SUBTRACTION.

	£.	s.	d.		£.	s.	d.
1.	48	16	9¾	6.	36	17	8¾
2.	18	19	2¼	7.	80	18	11¼
3.	58	18	3¼	8.	16	6	7¾
4.	39	16	8¾	9.	18	14	0
5.	69	2	2¼	10.	38	19	11¾

11.	£17	6	11½	19.	£14	1	2¾
12.	30	12	11½	20.	109	19	6
13.	2807	16	9¾	21.	111	2	6½
14.	14319	18	3½	22.	21529	11	6
15.	3500	0	5¾	23.	175	13	10
16.	770	0	3	24.	58	11	4
17.	337	0	0	25.	4166		6¼
18.	125	1	6				

COMPOUND MULTIPLICATION.

	£.	s.	d.		£.	s.	d.
1.	399	11	9¼	21.	442428	9	0¾
2.	412	8	7½	22.	549253	14	2
3.	306	2	4½	23.	8585	10	9¾
4.	463	3	8	24.	1927	8	1½
5.	126	5	0¾	25.	4072	14	8
6.	876	3	9	26.	71618	18	0
7	867	3	1¼	27.	219861	1	2
8.	719	15	6	28.	307812	13	2¼
9.	610	11	8¼	29.	218342	7	4
10.	548	7	8	30.	241165	18	11½
11.	349	6	1¾	31.	529051	3	10
12.	239	17	4½	32.	681984	18	2¼
13.	4408	10	6	33.	0	4	4
14.	6500	3	1½	34.	1	11	6
15.	6475	6	4½	35.	2	7	3
16.	44130	15	11	36.	0	10	6
17.	90483	3	1½	37.	41	15	6
18.	314848	12	10	38.	10	16	0
19.	302657	16	9¼	39.	115	10	0
20.	410410	15	4	40.	15	14	10

41.	20	13	0	51.	268	2	$5\frac{3}{4}-\frac{3}{4}$
42.	42	13	$10\frac{1}{2}$	52.	1096	2	$4\frac{3}{4}$
43.	501	17	6	53.	9402	8	$7\frac{1}{2}-\frac{1}{4}$
44.	6170	12	6	54.	5505	7	$2\frac{3}{4}$
45.	37	14	0	55.	53	18	$8\frac{3}{4}-\frac{3}{4}$
46.	2002	4	0	56.	47	7	$2\frac{3}{4}$
47.	254	7	6	57	2321	13	$2\frac{3}{4}$
48.	923	0	0	58.	5208	9	$5\frac{3}{4}-\frac{4}{5}$
49.	18	11	3	59.	39264	7	$9-\frac{5}{7}$
50.	60	13	$10-\frac{3}{4}$	60.	81637	4	$4\frac{1}{4}-\frac{3}{5}$

COMPOUND DIVISION.

	£.	s.	d.		£.	s.	d.
1.	34	8	$10\frac{3}{4}$	18.	400	1	$9\frac{1}{2}—\frac{6}{10}$
2.	14	4	$1—\frac{1}{3}$	19.	723	9	$3\frac{1}{4}—\frac{2}{12}$
3.	17	9	$7\frac{3}{4}—\frac{3}{4}$	20.	778	19	$9\frac{1}{4}—\frac{4}{9}$
4.	149	15	$0—\frac{3}{8}$	21.	458	17	$10\frac{1}{4}—\frac{6}{8}$
5.	29	9	$11\frac{3}{4}—\frac{1}{6}$	22.	730	4	$9—\frac{3}{12}$
6.	58	4	$10\frac{1}{2}—\frac{4}{7}$	23.	19	7	$3\frac{1}{2}—\frac{2}{5}$
7.	1080	19	$8\frac{3}{4}—\frac{7}{8}$	24.	4	13	$5\frac{1}{2}—\frac{4}{10}$
8.	834	5	$11\frac{1}{4}—\frac{5}{9}$	25.	53	7	$0\frac{3}{4}$
9.	506	0	$0\frac{1}{2}—\frac{9}{10}$	26.	2	7	$11\frac{1}{2}$
10.	789	16	$3\frac{1}{4}$	27.	0	10	$8\frac{3}{4}—\frac{5}{9}$
11.	392	12	$7\frac{1}{2}—\frac{6}{12}$	28.	1	17	$6\frac{1}{4}—\frac{3}{9}$
12.	14	2	$1—\frac{1}{7}$	29.	8854	4	0
13.	5	19	$2\frac{1}{4}—\frac{3}{8}$	31.	1	14	$1\frac{3}{4}$—14
14.	7	11	$0—\frac{8}{9}$	32.	2	2	$6\frac{3}{4}$—34
15.	72	0	$1\frac{1}{2}—\frac{7}{12}$	33.	3	6	10—95
16.	97	19	$1\frac{3}{4}$	34.	2	3	$9\frac{1}{4}$—3
17.	62	5	$7—\frac{1}{5}$	35.	2	210457	

36.	£6 16 5½—531	58.	£10 3 3¾—495
37.	8 15 3 —454	59.	11 9 6½—16
38.	6 0 3¼—109	60.	979 2 8
39.	17 9 1¾—¾	61.	85¼
40.	1 5 8¼—62	62.	0 16 6—12
41.	3 6 1 —111	63.	25000000 die.
42.	3 5 10¾—194	64.	2852—2220
43.	2 0 7¾—184	65.	14 10 3¼—388
44.	9 0 6½—136	66.	0 5 0¾—1916
45.	10 7 1½—387	67.	21 5 11½
46.	10 0 5¾—609	68.	4 16 0¼— 24
47.	12 4 1¾—3	69.	0 0 2 —8491
48.	10 7 7¼—3	70.	0 0 0¾—228504
49.	12 12 8¾—15	71.	0 0 8¼—22162
50.	17 16 10½—86	72.	0 0 0¼—85791
51.	12 7 3 —54	73.	0 0 0¼—183482
52.	9 8 0¼—185	74.	0 0 3 —166957
53.	13 13 2	75.	0 4 7¼—8770
54.	9 4 7¾—9	76.	0 0 0½—469854
55.	4 11 11¼—39	77.	0 0 9¼—192206
56.	10 1 9½—109	78.	0 0 1 —511821
57.	9 10 9¾—201	79.	0 0 4½—115068

REDUCTION.

1.	11882 farthings.	7.	87552 farthings.
2.	63478 pence.	8.	10692 pence.
3.	350150 farthings.	9.	£3394 10s.
4.	118865 halfpence.	10.	£444 13s. 3d.
5.	69552 pence.	11.	1751 gs. 18s.
	71520 farthings.	12.	1146 cr. 2s. 10d.

13. 113067 fourpences.
14. 9880 crowns.
15. £4884 10s.
16. 4947s. 6d.
17. 873740 threepences.
18. 57552 fivepences.
19 9621 fourpences 1½d.
20. 31932080 sixpences.
21. 33465 cr. 3s.
22. 118801½ seven shillings.
23. 36672 fivepences.
24. 2282 eightpences ¾d.
25. 16048 half-sovs. 2s.
26. 7327539 farthings.
27. 2890160 farthings.
28. 205072 ninepences.
29. 237725 three farthings.
30. 6152 fivepences.

WEIGHTS AND MEASURES.

AVOIRDUPOIS WEIGHT.

	cwt.	qrs.	lbs.	oz.	dr.
1.	29	1	19	0	0
2.	2	2	14	15	0
3.	6	2	11	0	0
4.	0	7	23	14	0
5.	46	2	14	0	0
6.	6	1	17	12	0
7.	2	1	21	8	0
8.	0	2	4	6	12⅘
9.	3	2	27	0	0
10.	9	3	4	0	0
11.	519	3	19	0	0
12.	21	0	13	12	0
13.	2854	1	27	2	13
14.	4	1	12	3	7
15.	211	3	1	4	0

16,	8 cwt. 3qrs. 5$\frac{1}{11}$ lbs.
17,	1 cwt. 3qrs. 26 lbs. 9 oz. 6$\frac{4}{10}$ dr.
18,	67$\frac{3}{9}$ parcels.
19,	1 cwt. 1 qr. 15 lbs. 2 oz. 3$\frac{20}{36}$ dr.
20,	475 hogsheads. 910 rem.
21,	192 tons. 19cwt. 3qrs. 6lbs.

TROY WEIGHT.

	lbs.	oz.	dwts.	grs.
22.	194	4	16	0
23.	0	389	10	6
24.	16	11	4	6
25.	0	6	5	6$\frac{4}{7}$
26.	15	4	1	14
27.	3	11	11	6
28.	30	7	8	8
29.	3	0	14	13$\frac{4}{12}$
30.	104	3	0	0
31.	25—$\frac{133}{569}$d.			
32.	6	6	16	12

LONG MEASURE.

	mls.	fur.	per.	yds.	ft.	in.
33.	0	29	36	3	0	0
34.	0	2	2	4	2	0
35.	0	4	30	2½	0	0
36.	0	0	3	2½	2	0
37.	118	5	18	3½	0	0
38.	4	5	5	0	0	0
39.	92	3	20	0	0	0
40.	1	5	13	0	0	0
41.	16	5	33	0	2	10

CLOTH MEASURE.

42.	118 yds.	0qrs.	2nls.	48.	443yds.	1qrs.	0nls.
43.	330	0	3.	49.	20	3	$1\frac{6}{9}$
44.	9	0	3_7	50.	47 yds.		
45.	4	0	$1\frac{4}{9}$	51.	10	1	1
46.	148	0	1	52.	11—$\frac{4}{5}\frac{1}{4}$ suits.		
47:	19	0	0				

SQUARE OR LAND MEASURE.

53.	167ac.	2rd.	14 per.	58.	1 ac.	1 rd.	9 per.
54.	189	2	4	59.	29	1	16
55.	22	1	30	60.	1	1	$26\frac{3}{13}$
56.	24	2	30	61.	65	0	33
57.	29	0	21	62.	2s. $3\frac{1}{4}$d.—4267		

MEASURE OF CAPACITY.

63.	195qrs.	6bush.	1pks.	69.	244qrs. 3bush. 0pks.
64.	397	4	0	70.	41 3 $3\frac{1}{6}$
65.	10	7	$2\frac{3}{4}$	71.	1049gals. 1qt. 1pt.
66.	8	6	$0\frac{6}{9}$	72.	13gals. 2qts. 1pt. 3gls.
67.	175	1	0	73.	224lds. 4qrs. 5bsh. 3pks.
68.	16	6	2	74.	806gals. 2qts. 1pt.

TIME.

75. 173yrs. 6wks. 5dys.
76. 177dys. 12hrs. 28min.
77. 15yrs. 47wks. 5dys.
78. 29dys. 15hrs. 30min.
79. 56wks. 2ds. 11hrs. 16m.
80. 2wks. 0dys. 19hrs.
81. 47hrs. 7min. 30sec.
82. 30ds. 10hrs. 29m. $4\frac{9}{13}$s.
83. 347126307 seconds.

REDUCTION.

AVOIRDUPOIS WEIGHT.

1. 854 lbs.
2. 1564 oz.
3. 89 lb. 3 oz.
4. 7032 lbs.
5. 812 parcels.

TROY WEIGHT.

6. 5760 dwt.
7. 5 oz. 2 dwt. 20 gr.
8. 5184 gr.
9. 6 spoons.
10. 23 oz. 2 dwt. 0 gr.
11. 21 spoons.

APOTHECARIES WEIGHT.

12. 27160 grains.
13. 5oz. 1dr. 1scr. 7gr.
14. 186 scruples.
15. 252 days.

LONG MEASURE.

16. 24560 perches.
17. 1332 yds. 1 ft. 4 in.
18. 200640 yards.
19. 57200 times.
20. 39600 times.

CLOTH MEASURE.

21. 3936 nails.
22. 299 yds. 2 nls.
23. 8 shirts.—8
24. 7 suits.—8

MEASURE OF CAPACITY.

25. 197 pints.
26. 585 gal. 3 qts. 1 pt.
27. 3863 pecks.
28. 1199 bushels.
29. 2016 gills.

TIME.

30. 1094 hours.
31. 51dys. 20hrs. 5ms.
32. 5302080 minutes
33. 341640 times.

SIMPLE PROPORTION.

1.	108s.	14.	165 ft. 2 in.—8
2.	£3 18 0	15.	405 men.
3.	£44 12 7½	16.	9d.—6
4.	44 9 4	17.	12 days.
5.	0 5 2	18.	7 dys. 9 hrs.
6.	3 13 $5\frac{1}{15}$	19.	3¾ months.
7.	147 6 8	20.	1⅓ month.
8.	5 0 2¾	21.	13⅓ days.
9.	5lb. 4oz. 6dr.—6	22.	1800 lbs.
10.	5s. 9¾d.—264	23.	6¼d.—1276
11.	£196 16s. 0¾d.—48	24.	£11 8s. 8½d.—6
12.	1333lbs. 9oz.—4	25.	137lbs. 7oz.—26
13.	£2380 10s.	26.	£75 15s. 4¼d.–336

COMPOUND PROPORTION.

1.	425 roods.-369	6.	10 horses.
2.	£38 8s.	7.	2250 men.
3.	240 acres.	8.	$55\frac{5}{9}$ days.
4.	58⅓ suits.	9.	£37 3s. 7½d.
5.	145 men.	10.	£5 3s.

BILLS OF PARCELS.

BOOKSELLER'S BILL...............	£5	18	6
HOSIER'S BILL......................	3	16	4
GROCER'S BILL......................	11	10	1

BILL OF BOOK DEBTS.

WINE MERCHANT'S BILL.........	£49	18

PRACTICE.

1.	£6	15	1½
2.	7	13	6
3.	1	3	0
4.	0	4	0
5.	1	6	9
6.	8	3	4
7.	30	6	4
8.	4	11	0
9.	180	19	0
10.	169	9	4
11.	26	15	3
12.	19	3	9
13.	17	8	3
14.	43	9	7¼
15.	35	14	2
16.	63	12	4½
17.	45	14	2
18.	99	2	11¾
19.	94	12	0
20.	133	9	8¼
21.	48	16	9½
22.	105	8	7½
23.	102	9	10½
24.	175	18	8
25.	123	2	7½
26.	125	13	1½
27.	297	1	4½
28.	278	13	0¼
29.	328	13	9
30.	87	19	7½
31.	182	11	5
32.	172	16	6¾
33.	£131	0	1
34.	147	13	2
35.	517	8	0
36.	118	8	0
37.	72	0	0
38.	871	4	0
39.	81	0	0
40.	673	4	0
41.	610	8	0
42.	64	16	0
43.	642	16	0
44.	1419	0	0
45.	1513	12	0
46.	918	15	0
47.	1230	18	0
48.	910	14	0
49.	1441	12	0
50.	3940	4	0
51.	1800	10	0
52.	3172	8	0
53.	1262	8	0
54.	3908	9	0
55.	5331	18	0
56.	1512	0	0
57.	2949	12	0
58.	1027	13	0
59.	3710	14	0
60.	7258	19	0
61.	89	12	0
62.	93	4	11
63.	32	14	0

64.	£263	6	1½
65.	149	9	0
66.	606	18	0
67.	1140	6	8
68.	1588	0	4
69.	905	15	7½
70.	3280	2	5
71.	2694	14	6
72.	1931	4	0¾
73.	3380	6	10½
74.	5099	17	11
75.	770	12	10
76.	1885	14	0
77.	4795	10	11¼
78.	3651	19	1
79.	8067	12	2¼
80.	3637	2	9¼
81.	2261	4	8
82	2862	17	9
83.	6631	2	2¼
84.	625	6	8
85.	2966	15	2
86.	1935	11	3
87.	3676	9	3
88.	7661	10	0
89.	59530	18	0
90.	41565	2	4
91.	42161	18	9
92.	25030	2	1½
93.	95335	17	9
94.	34203	5	5
95.	82671	6	0
96.	£32039	4	0
97.	92421	6	4
98.	56595	1	4
99.	46824	9	3¼
100.	109872	15	0
101.	163931	19	3
102.	137446	13	4
103.	86621	5	11
104.	250427	9	5

CASE VI.

105.	20	2	7¾
106.	351	0	5
107.	351	15	8¼
108.	42	10	2¼
109.	143	3	9
110.	69	9	9¾
111.	53	6	11
112.	37	6	6½
113.	95	11	9½
114.	182	7	9¾
115.	260	9	1½
116.	230	9	5
117.	169	9	7¾
118.	400	6	11¾
119.	372	4	8½
120.	443	13	7½
121.	237	0	3¾

CASE VII.

122.	16872	8	3
123.	34226	16	1

124.	3599	12	2	129.	8606	6	6
125.	1188	13	2¼	130.	3382	4	9½
126.	3436	17	9	131.	13747	9	6½
127.	41269	7	7¼	132.	32411	10	5
128.	50375	5	10¼	133.	4822	13	3¾

TARE AND TRET.

1.	49cwt.	2qrs.	9lbs. net.	8.	56cwt.	3qrs.	7½lbs.
2.	10	0	2	9.	46	3	21½
3.	50	3	3½	10.	22	1	24
4.	23	2	0	11.	167	2	25¾
5.	175	1	25	12.	30	2	9
6.	41	0	12	13.	36	1	14
7.	9	2	15	14.	£93	7s.	9¾d.

SIMPLE INTEREST.

1.	£53	8	0	14.	£757	1	1½
2.	231	10	9	15.	132	9	8½
3.	479	12	4¾	16.	1116	10	7¾
4.	237	5	3	17.	2380	17	5¼
5.	13077	9	0	18.	1338	9	0¼
6.	551	3	6¼	19.	2	15	11
7.	2041	18	11¾	20.	14243	12	3
8.	6619	2	11½	21.	53	14	9½
9.	566	11	11¾	22.	2	3	8
10.	1428	2	3½	23.	876	15	7½
11.	2	13	8¼	24.	1206	19	10
12.	5	10	7½	25.	120	6	6½
13.	11	2	11	26.	266	0	8

DISCOUNT.

1. £581 16 4½
2. 26 12 0½
3. £4 10 0¾
4. 2 5 2¼

COMMISSION, BROKERAGE, INSURANCE, BUYING AND SELLING STOCKS.

1. £12 8 4¾
2. 6 4 4½
3. 59 9 4¾
4. 3 2 3
5. 28 13 7
6. 408 2 0
7. 80 3 6¼
8. 172 17 9½
9. 286 18 0¼
10. 592 5 7
11. 494 8 5¾
12. 86 15 10
13. £835 16 0
14. 726 3 3½
15. 12546 4 9½
16. 10 14 10¾
17. 14 11 7
18. 44 15 4¾
19. 270 13 6
20. 802 11 2¼
21. 29 17 0
22. 3872 12 6
23. 205 13 0

COMPOUND INTEREST.

1. £66 4 0½
2. 720 6 5¾
3. 497 10 11¼
4. £155 12 3¾
5. 964 10 7¼
6. 237 14 5¾

BARTER.

1. 34⅓ pairs.
2. 32 lbs.
3. 63$\frac{21}{23}$ gals.
4. 254$\frac{1}{10}$lbs.
5. 427¼—$\frac{1}{15}$lbs.

PROFIT AND LOSS.

1.	£25 12 0	6.	£12 16 4—$\frac{12}{13}$
2.	6 15 4	7.	49 10 11—$\frac{33}{37}$
3.	7 17 4	8.	18 15 0
4.	2 14 0	9.	5 0 0
5.	9 10 0		

PARTNERSHIP.

		£.	s.	d.
1.	A's share,	240	1	11¼
	B's share,	723	18	0½
2.	A's share,	136	3	2½
	B's share,	238	3	7½
	C's share,	149	13	1¾
3.	A's share,	29—$\frac{60}{468}$		
	B's share,	41—$\frac{326}{468}$		
	C's share,	25—$\frac{12}{468}$		
4.	A's share,	44	8	10½—$\frac{12}{13}$
	B's share,	33	6	8
	C's share,	22	4	5¼—$\frac{6}{13}$

		£.	s.	d.
5.	A's share,	172	13	4¾
	B's share,	633	4	10½
	C's share,	1542	1	8¼
6.	A pays	25	18	4
	B pays	28	6	11¼
	C pays	43	14	8½
7.	A's share,	78	12	3½
	B's share,	101	1	6¼
	C's share,	123	10	9
	D's share,	134	15	4½

VULGAR FRACTIONS.

REDUCTION.

CASE I.

1.	$2487\frac{2}{3}$	8.	$1\frac{1539}{2104}$
2.	$604\frac{1}{2}$	9.	$96\frac{4731}{7687}$
3.	$227\frac{25}{43}$	10.	351
4.	$92\frac{21}{698}$	11.	$1\frac{4401}{487000}$
5.	$93\frac{86}{89}$	12.	$104\frac{4437}{7036}$
6.	$199\frac{28}{43}$	13.	$130\frac{1029}{3684}$
7.	$11\frac{392}{686}$	14.	$176\frac{1878}{4088}$

CASE II.

15. $\frac{15}{2}$

16. $\frac{26}{3}$

17. $\frac{89}{5}$

18. $\frac{178}{9}$

19. $\frac{193}{7}$

20. $\frac{9707}{15}$

21. $\frac{6130}{17}$

22. $\frac{29301}{33}$

23. $\frac{30329}{36}$

24. $\frac{8487}{27}$

25. $\frac{123000}{126}$

26. $\frac{354934}{421}$

27. $\frac{76285}{111}$

28. $\frac{180057}{234}$

29. $\frac{501248}{621}$

CASE III.

30. $\frac{30}{294}$

31. $\frac{168}{1485}$

32. $\frac{1615}{819}$

33. $\frac{352}{1188}$

34. $\frac{392}{323}$

35. $\frac{5304}{98325}$

36. $\frac{33048}{68376}$

37. $\frac{605880}{58968}$

38. $\frac{25056}{9282}$

39. $\frac{261807}{55575}$

CASE IV.

40. $\frac{3}{17}$

41. $\frac{23}{58}$

42. $\frac{4}{11}$

43. $\frac{3}{10}$

44. $\frac{148}{1735}$

45. $\frac{191}{1310}$

46. $\frac{161}{432}$

47. $\frac{55}{128}$

48. $\frac{1}{180}$

49. $\frac{249}{44}$

50. $\frac{7}{8}$

51. $\frac{11}{13}$

CASE V.

52. $\frac{63}{84}$ $\frac{56}{84}$ $\frac{48}{84}$

53. $\frac{360}{648}$ $\frac{567}{648}$ $\frac{432}{648}$

54. $\frac{2223}{2717}$ $\frac{1463}{2717}$ $\frac{1716}{2717}$

55. $\frac{8073}{9936}$ $\frac{4752}{9936}$ $\frac{6624}{9926}$

56. $\frac{315588}{445536}$ $\frac{325584}{445536}$ $\frac{159120}{445536}$ $\frac{340704}{445536}$

57. $\frac{3769038}{8435466}$ $\frac{3893292}{8435466}$ $\frac{5861934}{8435466}$ $\frac{2919969}{8435466}$

58. $\frac{10561057803}{12048530733}$ $\frac{1800355167}{12048530733}$ $\frac{7046929530}{12048530733}$ $\frac{1111488075}{12048530733}$

59. $\frac{1738284308040}{857382543080}$ $\frac{201170391800}{857382543080}$ $\frac{666658671252}{857382543080}$ $\frac{98700070840}{857382543080}$

ADDITION.

1. $1\frac{96}{136}$
2. $2\frac{170}{1001}$
3. $2\frac{107}{2678}$
4. $2\frac{165113}{351747}$
5. $1\frac{194675}{198237}$

$3\frac{116245}{4556625}$

7. $1\frac{874}{10920}$
8. $3\frac{14108}{31128}$
9. $53\frac{315}{378}$
10. $4\frac{9783}{27948}$
11. $14\frac{10759}{58653}$
12. $11\frac{78425}{456435}$

SUBTRACTION.

1.	$\frac{5}{28}$	6.	$2\frac{11}{56}$
		7.	$1\frac{11}{40}$
2.	$\frac{34}{99}$	8.	$2\frac{37}{70}$
3.	$\frac{31}{195}$	9.	$\frac{73}{143}$
4.	$\frac{93}{247}$	10.	$\frac{173}{1512}$
		11.	$154\frac{4}{7}$
5.	$3\frac{30}{32}$	12.	$63\frac{7}{12}$

MULTIPLICATION.

1.	$\frac{15}{32}$	6.	$2\frac{9}{13}$
		7.	$60\frac{15}{32}$
2.	$\frac{56}{99}$	8.	$17\frac{25}{48}$
3.	$\frac{3}{4}$	9.	$5\frac{1}{18}$
4.	$\frac{16}{351}$	10.	$5\frac{57}{91}$
		11.	115
5.	$3\frac{31}{48}$	12.	$181\frac{611}{936}$

DIVISION.

1.	$3\frac{3}{55}$	7.	8
2.	$\frac{7}{8}$	8.	$8\frac{3}{4}$
3.	$1\frac{11}{64}$	9.	$\frac{1}{5}$
4.	$2\frac{54}{105}$	10.	2
5.	$\frac{86}{111}$	11.	65
6.	$\frac{13}{36}$	12.	$1\frac{1}{2}$

REDUCTION, CONTINUED.

CASE VI.			
		3.	$\frac{4}{105}$ guinea.
1.	$\frac{3}{1120}$ £	4.	$\frac{184}{7}$ farthing.
2.	$\frac{960}{1}$	5.	$\frac{7}{2160}$ crown.

6.	$\frac{3}{70}$ week.
7.	$\frac{1176}{9}$ hour.
8.	$\frac{4}{80}$ yard.
9.	$\frac{200704}{5}$dram.
10.	$\frac{4}{5800}$ mile.

CASE VII.

11.	$\frac{28}{40}$£
12.	$\frac{13}{15}$£
13.	$\frac{81}{340}$£
14.	$\frac{213}{1}$d.
15.	$\frac{319}{1}$ farthing.
16.	$\frac{49}{160}$ day.
17.	$\frac{1795}{28672}$ cwt.
18.	$\frac{15456}{1}$oz.
19.	$\frac{900}{1}$dwt.
20.	$\frac{973}{1440}$day.

CASE VIII.

21.	17s. 1$\frac{1}{2}$—$\frac{6}{7}$d.
22.	10d.
23.	4s.
24.	19h. 38min. 10$\frac{10}{11}$sec.
25.	12s. 9$\frac{1}{4}$—$\frac{13}{23}$d.
26.	1 ft. 4 in.
27.	9 oz. 15 dwt.
28.	13 oz.
29.	3qr. 11 lb. 6 oz. 8$\frac{8}{27}$dr.
30.	5 fur. 26per. 3yd. 2ft.

PROMISCUOUS EXERCISES.

1.	9s. 4$\frac{1}{4}$—$\frac{29}{35}$d.
2.	3s. 3d.$\frac{1}{128}$
3.	12s. 8d.
4.	3$\frac{3}{4}$—$\frac{47}{55}$ f.
5.	11s. 8$\frac{1}{2}$—$\frac{1}{2}$ f.
6.	4s. 3$\frac{1}{49}$d.
7.	3s. 6—$\frac{36}{217}$d.
8.	16$\frac{52}{2933}$s.
9.	1 mile, 3 fur.
10.	1558$\frac{22}{45}$oz.
11.	3s. 4$\frac{1}{2}$d.
12.	4 cr. 1$\frac{11}{70}$d.
13.	7 yds. 2qrs.
14.	2s. 6d.
15.	2$\frac{1}{8}$d.
16.	£4 2s. 11$\frac{5}{8}$d.
17.	6s. 4d
18.	£227 12s. 1d.
19.	6s. 1$\frac{1}{2}$—$\frac{6}{7}$d.
20.	14 lbs.
21.	£51 3s. 1$\frac{633}{871}$d.

DECIMAL FRACTIONS.

ADDITION.

1.	671·458	5.	4541·03777
2.	806·698	6.	7396·1403
3.	1133·372	7.	5558·5850
4.	1374·2784	8.	1341·5851

SUBTRACTION.

1.	67·517	6.	182·7044
2.	8·045	7.	70·0346
3.	34·1202	8.	810·8879
4.	297·0121	9.	242·245787
5.	669·021	10.	327·2158

MULTIPLICATION.

1.	·0729	7.	110440·5021
2.	14·3561	8.	·492961
3.	7766·1112	9.	78·6
4.	·04118408	10.	3·6465
5.	·5642	11.	·40096
6.	8·79	12.	·76

DIVISION.

1.	2.8803+	7.	19·0202+
2.	1·784+	8.	9·114+
3.	10·354+	9.	3·81009+
4.	1·7807+	10.	2·161+
5.	·024	11·	248·618+
6.	2·96	12·	3·4689

REDUCTION.

CASE I.

1.	·625
2.	·25
3.	·875
4.	·333+
5.	·833+
6.	·166+
7.	·5625
8.	·0133+
9.	·9411+
10.	·7272+
11.	·0715+
12.	·00053+

CASE II.

1.	$\frac{1}{4}$
2.	$\frac{5}{8}$
3.	$\frac{3}{8}$
4.	$\frac{1}{200}$
5.	$\frac{1}{100}$
6.	$\frac{1}{1000}$
7.	$\frac{41}{100}$
8.	$\frac{21}{1000}$
9.	$\frac{7}{1000}$
10.	$\frac{19}{1000}$

CASE III.

1.	£·9729+
2.	£·790625
3.	£·6666+
4.	£·0375
5.	cwt. 3·57142
6.	yd. 1·4166+
7.	wk. ·00263
8.	mile ·63437
9.	guin. ·0188
10.	oz. ·275
11.	acre ·575
12.	mile ·00994

CASE IV.

1.	15s. 3d.
2.	6s. 9$\frac{3}{4}$d.
3.	1$\frac{3}{4}$d.
4.	3qrs. 1lb. 9oz. 1dr.
5.	14oz. 15dr.
6.	15lbs. 10oz. 14d.
7.	8$\frac{3}{4}$d.
8.	4$\frac{1}{2}$d.
9.	22hrs. 7min. 23sec.
10.	1 qr. 3 nl. 2 in.
11.	25per. 2yds. 1ft. 9in.
12.	8oz. 15dwt. 16dr.
13.	15 drams.
14.	19 dwt. 17 gr.
15.	12 oz. 7 dr.

INVOLUTION.

1.	64	4.	2476099
2.	2197	5.	1291467969
3.	1048576		

EVOLUTION.

1.	176	6.	157·08
2.	789	7.	$\frac{7}{12}$
3.	1111		
4.	45·3	8.	$\frac{14}{37}$
5.	69·247+		

CUBE ROOT.

1.	72	6.	37·5
2.	38	7.	19.86+
3.	73	8.	·376
4.	103	9.	·829+
5.	439	10.	1·93+

DUODECIMAL MULTIPLICATION.

	ft.	in.	″	‴	⁗	9.	£7 0s. 4½—⅔ f.
1.	42	7	6	0	0	10.	564ft 0in. 9″
2.	44	5	2	7	6	11.	£6 9s. 7⅙ f.
3.	106	9	0	9	3	12.	£126 9s. 4¼—⅓ f.
4.	565	11	4	9	8	13.	116 ft. 10 in. 6″
5.	1040	8	4	4	6	14.	100 ft 4 in. 1″ 6‴
6.	17105	2	3	4	6	15.	3419ft. 2i. 7″ 2‴ 10⁗ 6′′′′′
7.	27	9	4	0	0	16.	£2 1s. 0d.
8.	68	1	0	0	0	17.	77 ft. 6 in. 5″
						18.	£48 19s. 9¾—

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